October 1983

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sinclair user

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Issue No 19

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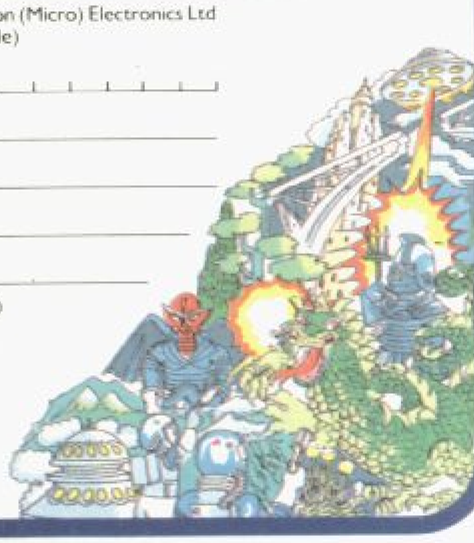
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If you would like to contribute to any of the Sinclair User group of publications please send programs, articles or ideas for hardware projects to:
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We pay £10 for the copyright of each program published and £50 per 1,000 words for each article used.

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NEXT MONTH

John Gilbert compares the growing number of compilers for the ZX-81 and the Spectrum and there is another special gift for readers of *Sinclair User*.

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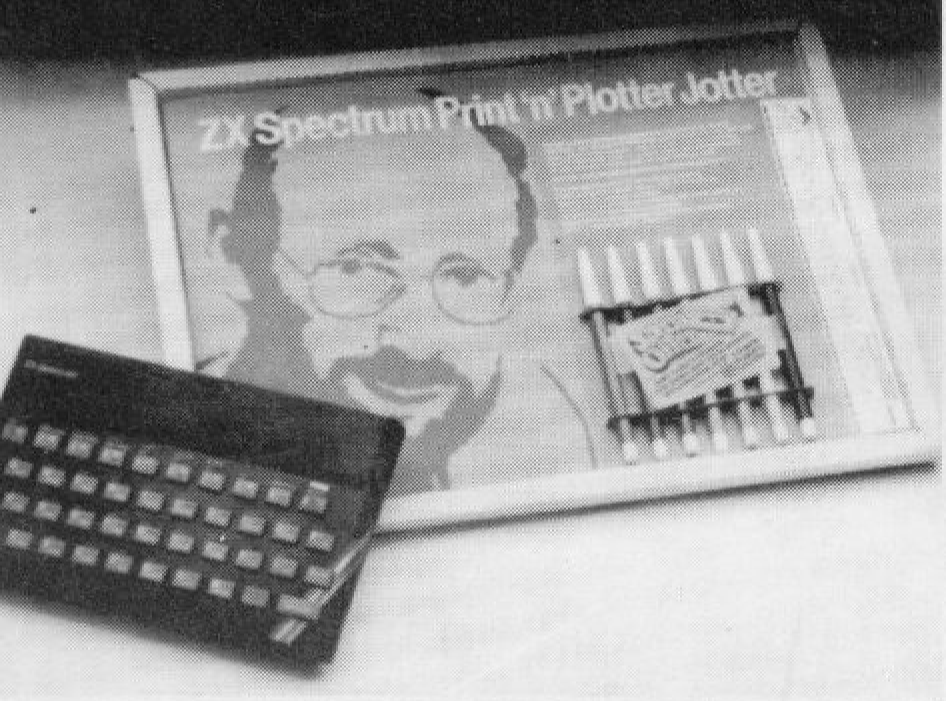
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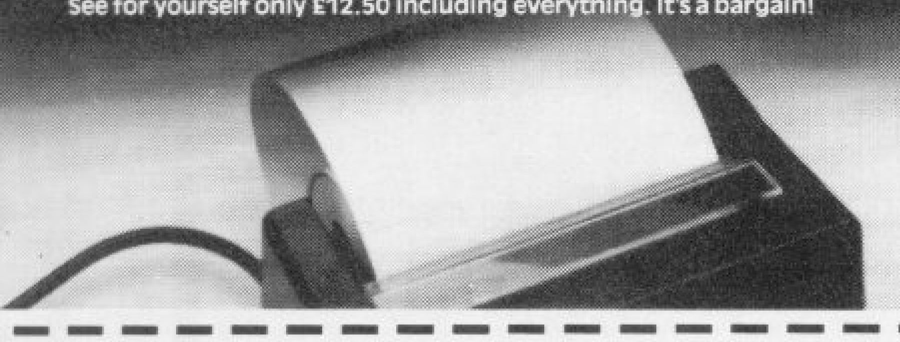
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Educational Supplies through Griffin & George Ltd.
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Sinclair now fixes demand

THE *Sinclair User* prediction for the autumn is that although the Microdrive has been launched they will be rarer than swallows in winter until at least the beginning of next year. That is not one of the most difficult predictions ever made in this column. The sales method chosen for the new add-on means that the growth in sales will be gradual rather than the usual mad scramble associated with earlier launches of Sinclair Research equipment.

We congratulate the company on the way it has been able to learn from its past mistakes. We did not expect, though, that such an education would result in such an unusual method of making sure that nobody's expectations were raised unnecessarily. Most companies in the position of Sinclair Research would have ensured sufficient items to meet the expected demand, tailoring supply to demand. Sinclair has approached it from the other side and made demand fit the supply.

Such a course of action is only possible and indeed only sensible when a company finds itself in the position of Sinclair Research. As in the past it has another product which is exceptional, which means that previous experience, both in the company and outside it, can give only an inexact guide to likely demand.

Initial orders for Sinclair computers have far outstretched supply when they have been first launched. It would seem sensible therefore to make sure that production and stocks are high enough to cope with the expected demand.

There is no guarantee, however, that even with a smooth production line and large stocks that demand would not again be far larger than expected and that the problems of 1982 would be repeated.

The alternative is to follow the example of Sinclair and keep a tight rein on demand by limiting the number of order forms which are sent to possible customers and delaying general release on retail sale until it has been able to gauge the possible market. In that way it is able to build production and overcome problems which almost inevitably occur when making something new, while avoiding causing disappointment and frustration by limiting sales to the amounts it knows can be dealt with within 28 days..

The chosen few are so limited at the moment that we at *Sinclair User* have yet to meet anyone who has received an order form, let alone placed an order.

It is a sales method which has limited applications. The firm involved must have some way of contacting its expected clients and there must be little or no competition. Sinclair scores on both points. Through its long-established policy of selling by mail order it has the names and addresses of thousands of owners of Spectrums and there is no-one else producing anything like the Microdrive.

It can thus afford the time to keep its possible customers waiting in the knowledge that there is nowhere else for them to go in the immediate future.

The concern must be that many people might not see any point in investing in the Microdrive and its associated interfaces while there are so few around. The network facility is of little use when there are very few other enthusiasts with whom to communicate and many people will want to see what professional software is available on the cartridges before deciding to take the plunge and spend £80.

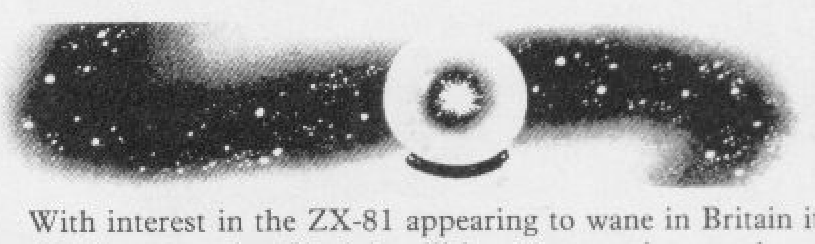
With the amount of such software being sparse for some time that leaves the RS232 interface as being the only reason for buying the system immediately. To follow that line of argument to its logical conclusion would mean a very slow take-off for Microdrive sales. With initial orders being slow, production would not be increased so fast as it might otherwise have been. That would lengthen the time people would have to wait for an order form, thus making more people reluctant to buy one — and again production would be restricted.

Obviously that would not be good for sales and even worse for Sinclair Research, which will be wanting to recoup research and development costs as quickly as possible.

It is not, however, something which we expect to happen. We believe there is a ready market for the Microdrive and its interfaces and that, provided it does not suffer from the usual unseen teething troubles and that output can be increased rapidly, there will be plenty of demand, with early machines possibly being re-sold at a premium and there being a ready market for order forms.

Such a situation would, of course, cause the information on the likely demand for Microdrives to be inaccurate. If everyone who receives an order form buys a Microdrive to re-sell it or sells the form to someone who wants to buy one the response will be greatly over-stated. No doubt Sinclair Research will be keeping a close watch on that.

Bearing all that in mind, it would appear now almost certain that no other computer will be launched in Britain by Sinclair until early next year. The Microdrive and the company's closer involvement in the development of software should keep it busy for the next few months. We also understand that there are no plans for introducing the Timex Sinclair 1500 on to the British market. The idea was considered but later rejected as it was thought impossible to fit between the ZX-81 and the Spectrum.



With interest in the ZX-81 appearing to wane in Britain it could also mean that Sinclair will be concentrating purely on the Spectrum and letting the ZX-81 drift into retirement. Despite the many uses which have been found for the ZX-81, and our Users of the Month are ingenious in their efforts to explore the possibilities of the machine, the games-dominated market prefers colour, a little sound and larger memory.

One market which might alter those calculations about the little machine is education. As a headmaster said in our letters column in the last issue, while children's appetites for computers and programming were being whetted at school, their parents still could not afford any of the machines at the moment and thus could not continue the interest at home.

Should the price of the ZX-81 fall further, and the recent Starter Pack offers seems to indicate that it could, then a large market, untapped so far, would be discovered. Link such a move to the determination of Sinclair Research to improve the level of software for the education market and the ZX-81 may find a new lease of life.

It could lead to new generation growing up with a completely new conception of what computers should look like and of what they should be capable. No longer would a proper keyboard be expected as a basic requirement or that it should be so large that it would be impossible to put into a schoolbag easily. In the meantime we shall wait to see if the Microdrive can live up to expectations.

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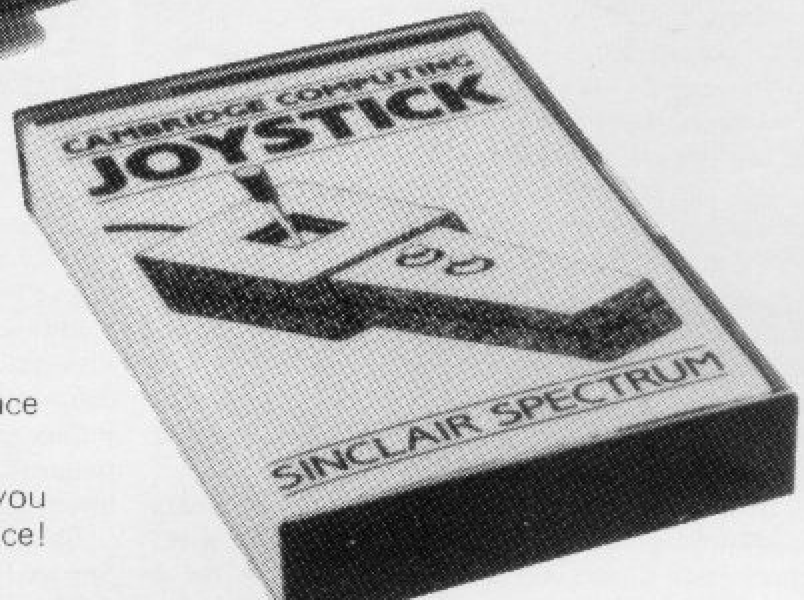
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Free cassette bonus for early offer orders

Prices of adventure and arcade games are reduced by 20 per cent exclusively for members this month.

THIS MONTH the Club will be giving one free cassette to each of the first 40 people who apply for software on offer. The games being offered free are **Spectipede** for the 16K Spectrum and **Golf** for the 16K ZX-81. Both games are from R and R Software.

The ZX-81 Golf is usually sold at £3.75 but we are offering it at £3. It allows one or two people to play a nine- or 18-hole course. All the usual golfing hazards will be encountered, including water, trees and bunkers.

Spectipede, marked down from £4.95 to £3.96, is R and R's most recent game for the Spectrum. It is a full feature arcade version of the classic game and includes colour effects which are unusual on the machine.

The Club also has its usual software offers with prices cut by up to £2.

The first offer is **Star Trek** for the 48K Spectrum which is also from R and R. The game is one of the best versions of the original mainframe computer games, with graphics routines added to improve the action. The game has an interesting self-destruct mode which will end play if the Klingons get too close. It costs £3.75 normally but we offer it at only £3.

Gnasher, also from R and R, is marked down from £4.95 to £3.96. It is a colourful version of Pac-man with all the appropriate arcade effects. Everything in this game is bigger than in most other versions and the action is fast and smooth.

Two Martech games on offer, **Conflict** and **Galaxy Conflict,** are adventure games with a difference. Both games are offered at £9.56 instead of the retail price of £11.95. In Galaxy Conflict the computer moderates between two players who have to battle it out for control of the galaxy. In Conflict, the computer again plays the moderator as the human players struggle to control nations and annihilate each other.

All this month's offers have been marked down by 20 percent from their original retail prices. That means a saving of nearly £2 on some items.

The method of obtaining software on offer has changed this month. Instead of sending order forms to the companies concerned, all cheques and postal orders should be sent to the Club's new address at 196–200 Balls Pond Road, London N1 4AQ.

Mike Meek, Sinclair User Club organiser, is pleased with the way new members are joining, especially those from the former National ZX Users' Group. He is, however, alarmed that Club members are not writing to their Club headquarters with any information which would be of interest to other Sinclair users. Meek will always be interested to hear news from members, especially if it can be shared with the thousands of users who read the Sinclair User Club page.

The Club is continuing to provide services to its members, including the telephone help-line which can be reached by using the number on the Club newsletter cassette.

As usual, those services and offers are available only to members of the club. Anyone wishing to join and take advantage of the offers should include an order form with application.

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Spectrum		
Golf	**£3.75**	**£3**
Star Trek	**£3.75**	**£3**
Spectipede	**£4.95**	**£3.96**
Gnasher	**£4.95**	**£3.96**
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Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Basildon Microcomputer Club: Roger Sims, Wickford 63032, after 6.30pm. Meetings every other week on Tuesdays from 7.30 to 10pm at Healey Management Services, The Hemmels, Laindon, Essex.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh: Edinburgh Home Computing Club. John Palmer (031 661 3183) or Iain Robertson (031 441 2361).

EZUG-Educational ZX-80–81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80–81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS.

Liverpool ZX-Computer Centre: Keith Archer, 17 Sweeting Street, Liverpool 2.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Epsom, Surrey KT19 0SY.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10 pm. Further information from R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80–81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: South Yorkshire Personal Computing Group. Enquiries to R Alderton (0742 20571), S Gray (0742 351440), P Sanderson (0742 351895).

Sittingbourne: Anurag Vidyarth (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Stratford-on-Avon ZX Users' Group: Chris Parry, 16 Sackville Close, Stratford-on-Avon, Warwickshire.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

West Sussex: Midhurst and District Computer User Group. Enquiries to V Weston (073 081 3876), R Armes (073 081 3279).

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworthy, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX-81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium: ASBL BDMA Belgium National Sinclair Club; P Glenisson, Rue De l'Epeestraat, 14, 1200 Bruxelles.

Belgium, France and Luxembourg: Club Sinclair, Raymong Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468).

Belgian User Group for Sinclair owners (BUGS); Op de Beeck, Patrick, Drabstraat 144, 2510 Mortsel.

Micro-Europe Club; R Betz, Chemin du Moulin, B1328, Ohain, Belgium. Telephone: CCP 000 0846556–37.

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.

J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jencyzyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Italy: Sinclair Club, Vie Molimo Veccho so/F, 40026 Imola, Italy.

Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX-80–81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.

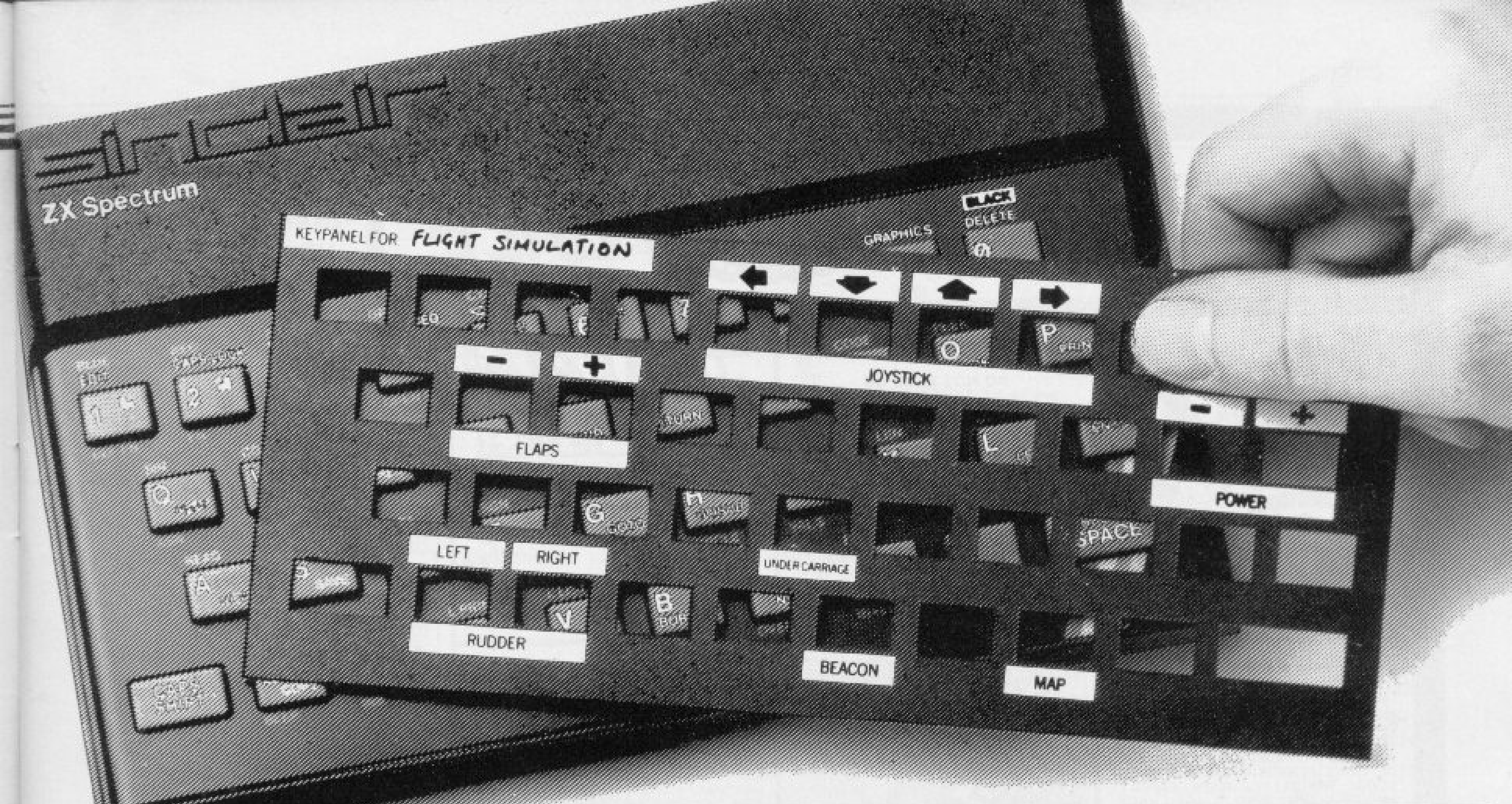
Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.

ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S–122, 22 Enskede, Sweden.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).



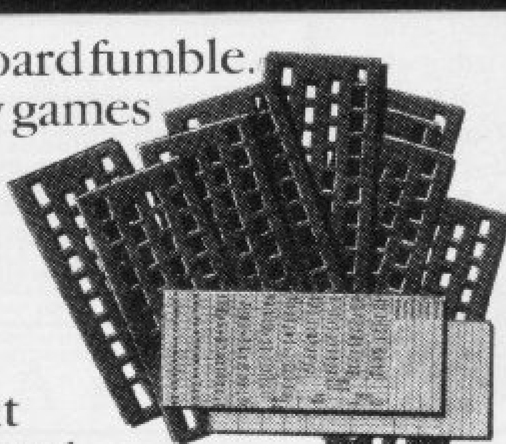
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Each kit comes in a clear plastic wallet and contains: 10 matt black Keypanels plus a sheet containing over 140 bright red self adhesive command labels, pre-printed with words and symbols – arrows, left, right, FIRE!, POWER!, etc, plus a sheet of blanks for your own designs.

The FIRST add-on for your Spectrum.



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We despatch to you first class post by return.

Post today to **Softeach Limited**, 25 College Road, Reading, Berkshire, RG6 1QE.

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.... Spectrum Keypanel Kits at £3.95 + 35p p&p each (overseas should add 25% for additional surface mail)

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NAME ....

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....

PROGRAMS WANTED

SPECTRUM DRAGON
BBC ZX81

WORK FORCE

THE BIGGEST
LITTLE SOFTWARE
HOUSE AROUND

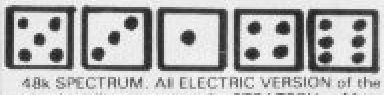


DO NOT PASS GO

Now the SPECTRUM VERSION IS READY

D.N.P.G. is a complete simulation of THAT BOARD GAME you know PARK LANE and all that. Up to SIX PLAYERS can compete with the MICRO doing all the work. Acts as DICE THROWER, BOARD, RENT COLLECTOR, UMPIRE, BANK, RULE BOOK, ACCOUNTANT, ESTATE AGENT and ASSET RECORDER. SUPERB GRAPHICS by GARRY KENNEDY (thanks mate). GAME SAVE with winner so far report. Complete with full instructions. The ULTIMATE in FAMILY GAMES. DON'T MONOPOLISE YOUR MICRO. AMAZE your friends and family (Can you imagine your GRANNY on a MICRO?) A 16k ZX81 version also available. 48k SPECTRUM or 16k ZX81 versions **ONLY £6.95.**

YAHTZI 48K



48k SPECTRUM. All ELECTRIC VERSION of the classic dice game of STRATEGY. More CHUNKY graphics from GARRY KENNEDY. No extras required up to SIX PLAYERS can compete, or practise if you wish. SPECTRUM acts as UMPIRE, SCORE SHEET and DICE THROWER. Update your games cupboard for just **£5.50.** 48k only.

UP TO 6 PLAYERS £5·50

STOP PRESS
MORE SPECTRUM MAGIC

No time for the pictures all ready now!!!!

DOOM BUGS

We vote this game as the best arcade game submitted. REMEMBER that comfortable feeling when "IT ALL FELT RIGHT" and that ANTICIPATION before each NEW GAME. Well IT'S BACK and it really does FEEL GOOD. Trapped in GRUBBER'S LAIR the aim is to escape to the next level by eating your way through the trapdoor whilst being pursued by BUGS, BUBBERGRUBBERS and GRUBBER HIMSELF. GREAT GRAPHICS, AGF JOYSTICK COMPATIBLE, FAST, TWO LEVELS and you are not going to believe how much fun it is. PRO-ARCADERS ONLY £5.50 for 16-48k version. ABSOLUTELY MAGIC!!!

TRIPLEX

Our CONTENDER for BEST PROGRAM GRAPHICS of the YEAR. TRIPLEX a 3 part game featuring the BEST GRAPHICS YET!!! MOONSHINE ALLEY, a LOW gravity ASTEROID belt in HIGH RES SPLENDOUR. CAKEWALK a SLICE through a RAINBOW VORTEX. ALIEN ALLEY a fight to the DEATH with the HUNTER KILLER SHIPS. A PRO-ARCADE game with a difference. MORE skill than PACE. STATE OF THE ART GRAPHICS. £5.50 for FREE VIEWING.

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This one's for THINKERS ONLY. Based on the BLACK BOX principle a game with PURE RULES and requiring a high degree of REASONING and DEDUCTIVE SKILLS. Each game lasts HOURS and becomes PROGRESSIVELY more DIFFICULT. It's a PUZZLE why it's so CHEAP at £5.00.

PIRATE ISLAND

WANTED ADVENTURE FREAKS. Join forces with THE PIRATE and search the ISLAND for the TREASURE. A FAST RESPONSE program ABSOLUTELY NO RANDOM FEATURES. Can you trust a PIRATE. There's BUT ONE WAY to FIND OUT. FOR £5.50 you get a whole ISLAND full of TREASURE, TRAPS, RED HERRINGS and many hours of FRUSTRATING FUN. A TRADITIONAL ADVENTURE. 48K ONLY.

THE WINGED AVENGER

Fast and furious. Two versions of the same game on the SPECTRUM tape,, the original and the NEW VERSION. SOUND, GRAPHICS, SEVEN SKILL LEVELS. Full ARCADE ACTION including THREE WAVES OF ALIENS, HIGH SCORE, REFUELLING, RAPID REPEAT FIRING, SMART BOMBS and LASER SHIELD. P.C.W. "ONE OF THE BEST SINCLAIR GAMES YET". HOME COMP WEEKLY "FOUR STAR WINNER". 16k ZX81 VERSION "PROBABLY THE FASTEST ZX81 GAME". NOTED as EXCELLENT by the INTERNATIONAL BUREAU OF SOFTWARE TEST. 16k ZX81 & 16+48k SPECTRUM VERSIONS AVAILABLE. **NOW £5.00.**



NEW RELEASE
"JAWS REVENGE"
48k SPECTRUM

Disappointed with his box office returns JAWS brings his GORY EATING HABITS to the SPECTRUM in his very own ARCADE GAME. JAWS eats his way through a mixed diet of DIVERS, BOATMAN, JELLYFISH, SWIMMERS and FISH. You control JAWS in this FAST MOVING trail of carnage. Avoid DEPTH CHARGES, EXPLODING JELLYFISH, HARPOONS, ARMED SCUBA DIVERS and EAT everything you can. 5 LIVES, SCRAMBLE type SEA BED, current and HIGH SCORE. ALL MACHINE CODE and FAST. DEMO SCREEN. BONUS LIVES, FASTER GAME FOR 10,000 POINTS. WREAK HAVOCK ON THE HUMAN RACE. "THE BEST GAME YET" ANIMAL RIGHTS MOVEMENT". 16 & 48k SPECTRUM **£5.00.**

MATCALC
16 & 48k SPECTRUM

This is our SPREADSHEET PROGRAM with a difference. This ONE has the option of the standard display or a 64 CHARACTER per LINE display or printout. Ideal for WHAT IF, CASH FLOW PROJECTIONS, and analysing related figures. FORMULA may be MATHEMATICAL or LOGICAL. MENU DRIVEN. SAVE and LOAD to TAPE. FULL instructions and TWO matrices on TAPE with a full explanation of their formation. P.C.W. "MORE FLEXIBLE overall than . . . ". Both the 16k & 48k versions on ONE TAPE. SIMPLY HUNDREDS OF USES. **JUST £7.00.**

"SHIFTY" 48k SPECTRUM

A WORD PROCESSOR FOR THE SPECTRUM. "SHIFTY" was designed to overcome the limitations of the standard SINCLAIR HARDWARE, specifically the PRINTER. Using the STANDARD PRINTER all output over 32 CHARACTERS PER LINE is PRINTED SIDEWAYS allowing pages to be formatted from the printer paper. Any width from 20 to 80 characters per line may be specified. Text can be viewed prior to printing and can be JUSTIFIED to the RIGHT MARGIN. SHIFTY will WORD SEARCH, MOVE PARAGRAPHS, SPLIT PARAGRAPHS, APPEND PARAS, SAVE and LOAD from TAPE, INDENT PARAS and allow standard PHRASES to be STORED and accessed from DATA STATEMENTS using DEFINED KEYS. EDITING is ON SCREEN using 4 way CURSOR MOVE. SHIFTY comes complete with a sample letter and full instructions. Requires ZX printer. **ONLY £7.50.**



WORK FORCE GIVE-AWAY

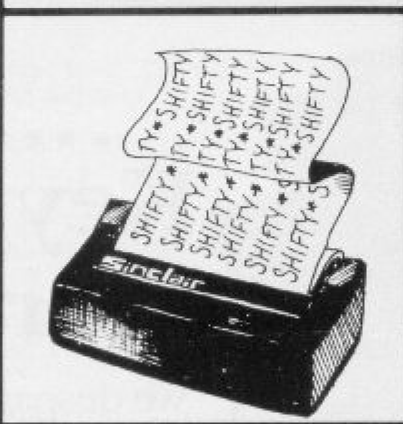
3 WELL REVIEWED MACHINE CODE ARCADE GAMES on one tape as a SAMPLER. HIGH NOON and BASE INVADERS were rated as the best versions available and SCRAMBLE even beat the reviewers when they tried it.

BASE INVADERS
THREE SPEEDS the fastest INVADERS. HIGH SCORE and SHIELD AVAILABLE if you CAN'T HANDLE the ACTION.

HIGH NOON
SMOOTHIE GRAPHICS, FAST ACTION and GOOD SOUND. The best COWBOY SHOOT OUT.

SPECTRUM SCRAMBLE
EIGHT DIRECTIONAL MOVEMENT. LASERS, BOMBS, ROCKETS. INSTANT RESPONSE, CONTINUOUS SCORING, SOUND, FUEL DUMPS, RED METEORS, DEFENDER CRAFT and HIGH SCORE. Classic arcade action.

Three PRO-ARCADE GAMES worth £13.95, yours for £6.50. LESS THAN HALF PRICE. THE BEST VALUE EVER FOR 16 & 48k SPECTRUM.



DISPLAY

How would you like 273 different USER DEFINED GRAPHICS on a 16k SPECTRUM or a FULL 336 on a 48k. All can be displayed on screen at the SAME TIME. U.D.G's are stored as PAGES and any two pages may be EXCHANGED in MEMORY. FILES may be SAVED or LOADED from TAPE at a USER specified location. TURN a UDG one quarter or half turn. FLIP a UDG over, REVERSE a UDG, EXPAND a quarter UDG into a FULL CHARACTER. MOVE a UDG one PIXEL at a TIME, UP, DOWN, LEFT or RIGHT. FIVE complete TAPE FILES are INCLUDED on tape ONE CONTAINING a 64 CHARACTER DISPLAY. DESIGN GRID for constructing CHARACTERS and SHAPES. FULL INSTRUCTIONS and ANIMATED DEMO SCREEN. **£7.00.** 16 & 48k SPECTRUM.

PROGRAMMERS DREAM
16k or 48k SPECTRUM.

An advanced SPECTRUM TOOLKIT. Comprised of just 1450 BYTES of POSITION INDEPENDENT MACHINE CODE. RENUMBER lines or blocks. Allows START, FINISH, INCREMENT and new START to be defined. BLOCK or line MOVE including RENUMBER to fit available GAP. RENUMBER will renumber ALL GOTO, GOSUB, LIST etc without further action. CHANGE strings (NAMES or CONTENTS. DUMP VARIABLE NAMES and CONTENTS to DISPLAY PROGRAM SIZE with or without VARIABLE SIZE. This package is FAST, CLEAN, PRODUCES ERROR MESSAGES and is WELL DOCUMENTED. S.USER "WORKS LIKE A DREAM" SPECTRUM ONLY **£6.95.**

ZX-81 16K USERS IMPORTANT ANNOUNCEMENT

WORK FORCE now appointed as U.K. distributor for VENTAMATIC SOFTWARE of SPAIN. 6 of the BEST PRO-ARCADE games LAUNCHED NOW!!. SPECTRUM FOLLOWS. "STATE OF THE ART" for PRO-ARCADERS ONLY. Special launch offer each TAPE contains 2 MACHINE CODE MASTERPIECES for JUST £4.50. NO RUBBISH.

DANGER TRACK

RACE a CAR through a maze 30 times larger than screen. Collect 10 FLAGS, BEWARE 5 ATTACKERS, THROW SMOG BOMBS. ON SCREEN RADAR MONITORS WHOLE MAZE. SPECIAL RESOLUTION.

AND

BUMPER THUMPER

PURSUED by the CHASER you have to PUSH the THUMPERS off SCREEN. All BLOCKS are SLIDERS but don't go near the CHASER or you get "YOUR BUMPER THUMPED". GOOD GRAPHICS.

PHANTOMS

PHANTOMS a HAND CRAFTED version of "..MAN" TWO LEVELS of PLAY, THREE MAZES, ENERGY DOTS, POWER PILLS, FRUITS, FOUR GHOSTS, ESCAPE CORRIDORS, and GREAT GRAPHICS. PRO-ARCADERS only NO FUMBLERS.

AND

CASHBOOT

A MANIC BOOT driven relentlessly by MACHINE CODE. LEAP from square to square knocking out FLAGS. BEWARE the BOOT crashing around. One false move and it's "cobblers" for you. SPECIAL GRAPHICS, HIGH SCORE and several screens.

SPACE BATTLE

PURE MAGIC. Complex 3D GRAPHICS. Unlimited galaxy: STARFIGHTERS attack at SPEED in 3D. 3 Keys GIVE 8 directions. 4 to 6 IMAGES per SECOND. 9 to 10 depth PLAINS. The BEST RESOLUTION at THIS SPEED. YOU HAVEN'T SEEN A PROGRAM THIS GOOD.

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CLASSIC ARCADE GAME only this one's for PROS ONLY. 2 STAGES of RESOLUTION. SELECTABLE LEVELS of GRAVITY. MACHINE CODE gives instant CLOSE UP of LANDING. PRECISE CONTROL AND FINE GRAPHICS. The HARDEST YET. NO BEGINNERS PLEASE.

WORK FORCE

140, WILSDEN AVENUE
LUTON BEDS.

Post Included

Spectrum sales top 500,000

SALES OF the Spectrum have topped the half million mark, according to Sinclair Research.

The sales both by mail order and retail cover the period from April, 1982 to August, 1983. By comparison 400,000 ZX-81s were sold in a similar period between March, 1981 and July, 1982.

Nigel Searle, managing director of Sinclair Research and the Sinclair new products division, said that he was delighted with the sales figures and that Sinclair Research would continue to support the machine with new peripherals to keep Sinclair owners occupied. They include the ZX Interface 1 and Microdrive units, which were finally launched in August.

New peripherals to be launched later this year will include a joystick and a cartridge interface. They will put the Spectrum in line with machines such as the Atari and Vic-20 which both have cartridge facilities.

Metalab gets a new base

SINCLAIR RESEARCH has bought Milton Hall in Cambridge which it plans to convert into the headquarters of its new Metalab project.

The Metalab will be a £2 million facility for high technology research. Sir Clive Sinclair says:

"The spacious landscape of Milton Hall makes a superb environment for the research we will be doing."

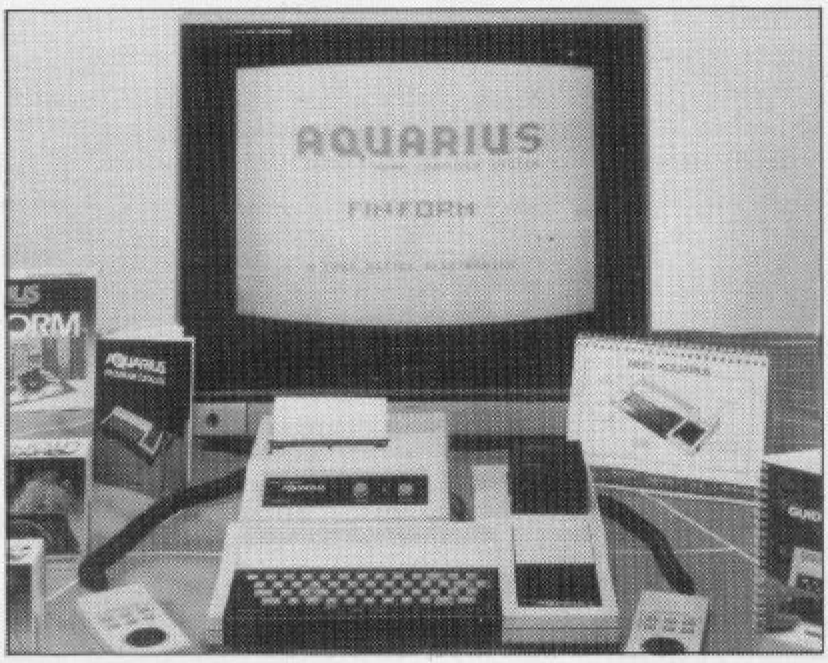
The building has 16,000 sq. ft. of workspace for the Sinclair team of research scientists and will form part of Sinclair Research advanced products division.

Aquarius leads the fall in prices

THE AQUARIUS is the first colour computer to cost less than £80.

The new machine from Mattel, manufacturer of the Intellivision video game system, is aimed at the small computer market which includes such machines as the ZX-81 and Spectrum. Mike Lunch, managing director of Mattel Electronics U.K., says:

"The U.K. has been chosen to spearhead our launch as it is the most sophisticated and fast-developing market. We estimate that by the end of 1983 almost two million households in the U.K. will have a home computer and that sales will be running at the rate of about 750,000 units. That means that the market must be worth more than £100 million annually."



The Aquarius does not match the specifications of the Spectrum in some respects. It has 4K of standard internal RAM which can be upgraded in four 16K units to 52K. The keyboard is similar to that of the Spectrum, although it uses firm plastic keys and not the rubbery ones used by Sinclair.

The central selling point made by Mattel about the machine is that it already has a good deal of software which can be run on it. The peripheral support, such as disc drives and printer, are ready and will be released later this year.

Micronet adaptor adapted

THE LAUNCH of the Micronet adaptor for the Spectrum was delayed once again before its final release in August because of an incompatibility with the new Sinclair Microdrive.

The device was originally to have been launched in May but that deadline could not be met. Since then various launch dates have been quoted, including June 1 and the end of July. Since its press launch potential customers have been put on a waiting list and order forms for the devices are now being despatched.

The incompatibility of the adaptor with the Microdrive was discovered quickly after the launch of the new Sinclair peripheral. Several thousand Micronet adaptors had their ROMs re-programmed so that the Spectrum would accept both devices at the same time.

The major problem was that the Spectrum works on the precedent of one device being the first, or more important, peripheral and that software would be needed to use both devices together.

David Babsky, editor of *Micronet,* says that both devices are now compatible. "I have tried both devices together and they work."

ULA is changed

SINCLAIR RESEARCH has changed the Uncommitted Logic Array on the Spectrum to avoid tuning problems which had dogged some owners who were trying to use some Japanese television sets with their computers.

The problems included a flipping picture, no colour, and no picture. Japanese sets from Hitachi and Toshiba caused difficulties as some have not abided by standards set out by the rest of the industry.

It has been stressed that the changes in the ULA should cause no problems if old software is run on the new machines. It will mean that purchasers of Spectrums will have a wider range of television sets which will be compatible.

Market is now more sophisticated

FOLLOWING the rapid expansion in sales of inexpensive computers, the market has entered a new phase where more sophisticated machines, such as the Spectrum and BBC micro, are in great demand.

That is due largely to the inexpensive products of companies such as Sinclair Research and the prominent marketing of those products by W H Smith, according to a report from Mintel Publications Ltd.

The report shows that in 1982 computer sales increased to 750,000 and this year Mintel predicts that they will reach the one-and-a-quarter million level. In 1983 the market value should be £200 million, plus a further £80 million for add-on peripherals such as disc drives, and software such as games cassettes.

The trend, according to Mintel, has now moved towards the purchasing of more expensive machines such as the Spectrum, BBC micro and Vic-20. At the same time there is a switch from mail order to shops which offer specialist advice on the machines they sell. Those shops include chain stores such as Laskys and Currys.

The 1983 estimates of retailers' share of trade in the computer market puts W H Smith in front with 18 percent. Tandy and Spectrum stores follow with 12 and eight percent respectively. Dixons and Boots are at the bottom of the table, apart from mail order and small outlets which have two percent of the market each.

Mintel predicts that there is still plenty of growth potential but that a shift will take place towards peripherals and software. In 1984 computer owners will be looking to expand their machines.

Sinclair boosts software interest

SINCLAIR RESEARCH has decided to take a more positive role in the development of software. It is concentrating on the educational market first, where the recent deal with Macmillan, the publishers, is seen as an important move to raising the standard of educational software in this sector.

Alison Maguire, who is responsible for software development, said that in the past Sinclair had been reacting only to what was available from other suppliers.

"If something was not available, we did not try to make sure that something was written.

"We wish to act now more like a publisher," she says.

She adds that as an example the educational market is seen as an area into which Sinclair Research will be moving and it will need good software to help the machines realise their potential.

"People will be buying more and more educational software and it is important that it fulfils real educational purposes," she says.

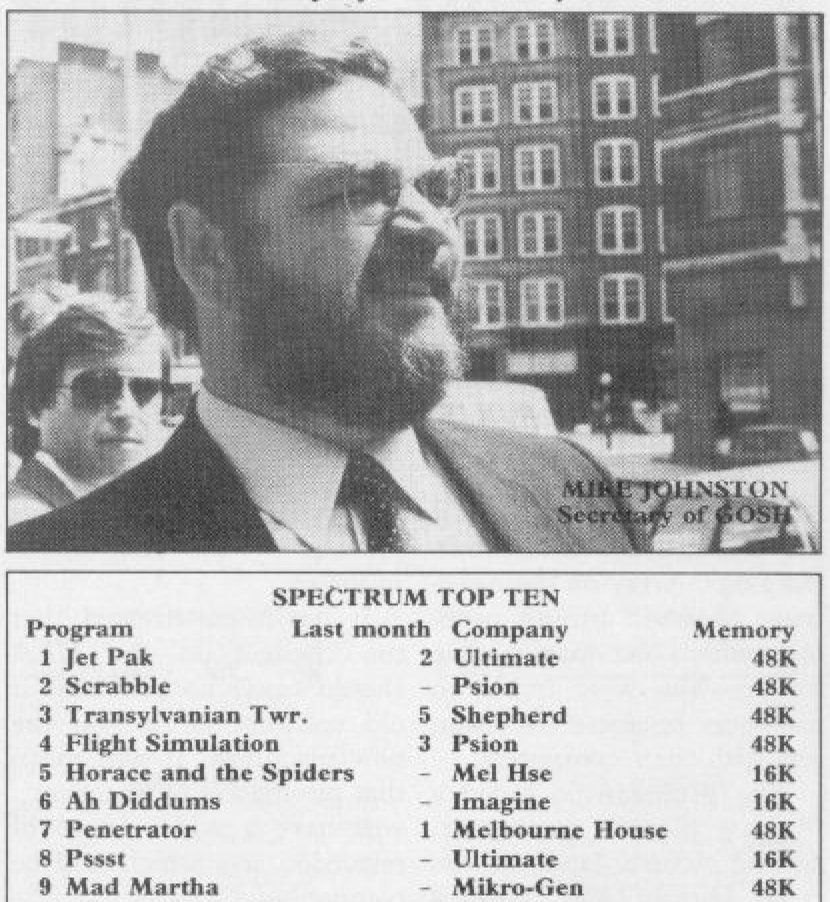
Other areas of the market are also to be considered, such as games and business. Maguire says she is interested in talking to any software house about new projects.

Software houses group together for protection

A GROUP of software houses has launched a new organisation to stabilise the computer market and keep the standards of software production and retail at the highest level possible.

The Guild of Software Houses has been set up by a number of large software companies, including Quicksilva, Bug-Byte, New Generation, Silversoft and Virgin Games.

The guild claims that a new customers' charter will ensure a commitment to maintain promised mail order delivery times, replace defective stock and deal promptly with complaints.


MIKE JOHNSTON
Secretary of GOSH

According to GOSH, not only individual customers will benefit from the new service. A dealer charter for the trade has been drawn up and a code of conduct for software houses in dealing with one another has been arranged.

Any software house found to be in breach of the contracts will be subject to guild disciplinary procedures. Membership of the guild is by annual subscription of £500 but only software houses able to satisfy the committee that they can maintain the guild pledges to dealers and customers will be elected.

The president of GOSH is Nick Alexander, who is also chairman of Virgin Games, and the vice-chairman is Rod Cousens of Quicksilva. All enquiries from software houses wishing to join the guild should be addressed to Mike Johnston, organiser of the ZX Microfairs, who is the secretary of GOSH. He can be reached at 71 Park Lane, London N17 0RG.

SPECTRUM TOP TEN

Program	Last month	Company	Memory
1 Jet Pak	2	Ultimate	48K
2 Scrabble	-	Psion	48K
3 Transylvanian Twr.	5	Shepherd	48K
4 Flight Simulation	3	Psion	48K
5 Horace and the Spiders	-	Mel Hse	16K
6 Ah Diddums	-	Imagine	16K
7 Penetrator	1	Melbourne House	48K
8 Pssst	-	Ultimate	16K
9 Mad Martha	-	Mikro-Gen	48K
10 Horace Goes Skiing	7	Mel Hse/Psion	16K

China visit to promote the ZX-81

BRITISH SINCLAIR-based businessmen have recently visited China to promote the ZX-81. They were part of a group to advise on how to sell computers.

It included Nigel Searle, managing director of Sinclair Research; Richard Hease, chairman of ECC Publications which publishes *Sinclair User;* and Bob Denton, managing director of Prism Microproducts, distributor of Sinclair products and a sister company of ECC.

It is reported that the group hopes to introduce the ZX-81 into China before cheaper lookalikes of the computer become available. This move follows the scare produced by the introduction of a computer called the Peanut, an inexpensive copy of the Apple II.

Contest is broadcast over the radio waves

AUTOMATA, the company which created **Pimania,** has launched another competition with Radio Victory of Southampton in which the questions are broadcast in the form of programs from a Spectrum.

The competition started on June 18 and has been broadcast at 1.30pm every Saturday on 95MHz VHF since that date.

Entrants must pick up the programs either directly from a radio or by using a tape recorder. The program consists of one screen of text with the Radio Victory logo and one line of a famous song beneath it.

Listeners must guess the title of the song and send the answer to Radio Victory disc jockey Dave Carson.

Prizes for the competition are £5 gift tokens but Christian Penfold of Automata hopes that the sponsorship gained from the broadcast will result in bigger prizes.

"The initial prizes were small but we hope that if this takes off we can arrange to give bigger prizes. The response from the first week's competition was amazing. It started as a six-week experiment but because of the response we hope that we can continue it for a long time."

People who live outside the Radio Victory area may still be able to pick up the signals. Radio Victory is boosting the signals to just within the limits set by Independent Broadcasting Authority guidelines. People have heard signals in Brighton and the Isle of Wight.

Penguin programmer

A COMPETITION to find the Young Programmer of the Year is to be launched on September 1 by Penguin Books in conjunction with Sinclair Research and the National Association of Youth Clubs.

The competition is aimed mainly at children aged between seven and 15 and will be judged by Patrick Bossert, the 15-year-old author of *You Can Do the Cube.*

The award will be advertised in the national press and special attention will be paid to schools, youth clubs and computer groups.



Technical uses need promoting

TODAY'S low-cost home computer — e.g., the Spectrum — is a sophisticated, powerful machine having the capabilities of the minicomputers of a decade ago which then cost £10,000-£15,000. Those expensive minis were properly used as tools for serious applications. So why is the £130 home computer not similarly used in the same roles?

Unfortunately they have become saddled with the image of toys.

It is clear that the potential serious user of a Spectrum, who is not interested in computing *per se*, is dissuaded from buying the computer, even at £130, to run one program. If it could be demonstrated that there was a library of genuinely useful programs available, low-cost computing would really begin to fulfil its promise.

I wonder whether Sir Clive has perceived this problem? It would be a pity if he rushed into bringing out a new business machine without first doing something to encourage and establish the Spectrum in the area of serious applications.

A start could be made by devoting space at all computer shows to demonstrations of serious software.

Serious application programs are, by their nature, often specialised, and the creation of individuals with expert knowledge of a particular field. Because of that, marketing can be both expensive and difficult — the intended user tends not to be a computer buff and does not buy computer magazines.

In an attempt to allieviate the problem I am preparing a software directory of genuinely useful technical programs available for the Spectrum.

The directory will be titled *Spectrum Technical Software.* If any of your readers would like to participate, they should write to me for a questionnaire.

G A Rooker,
Beamscan,
20 Vaughan Avenue,
London NW4.

Geometric progression

ACCORDING to the Spectrum manual, if a number is substituted for "x" in the program below a circle will be drawn. I have found that with certain numbers substituted for "x" a geometrical figure is drawn repeatedly ending in a high-resolution pattern between two circles. Good numbers to demonstrate it are 525 — which draws a triangle and rotates it — 625 and 4125.

10 PLOT 100,50: DRAW 100,100,x.

R. Wysocki,
Todmorden,
Lancs.

Listing script under fire

AS A NEWCOMER to home computing, having recently acquired a 48K Spectrum, may I say how interesting, informative and really helpful I have found *Sinclair User?*

I do not propose to join the correspondence about wasted space devoted to illustration in your program listing pages but I would like to ask why you find it necessary to publish program listings in what I can only describe as infuriating pseudo-television script. I find listings so printed difficult to read on occasions, though your magazine is certainly better than some I have seen in this respect. Surely it is possible to use a conventional and more easily legible form of type face while retaining the uniform 32 characters per line which Spectrum listings seem to require. Why not keep the television script to the place where it belongs — the television screen?

J H Sharpe,
Godalming,
Surrey.

● *The script we use for the listings is not governed by any aesthetic qualities but by the practicalities of publishing accurate programs. The system we use is to check the program and then list it directly from the machine, thus reducing the possibility of mistakes which can creep in. The alternative would be to have the listings printed which would increase the possibility of errors.*

How valuable are they?

I AM WRITING for assistance with a series of articles to illustrate how microcomputers are playing an increasingly valuable role as a low-cost aid to management.

Can I ask readers to write to me with their experiences of installing a micro at work, be it a ZX-81 or an IBM? What problems they have encountered in software and hardware? Did the salesperson know what they were selling? Did, and was the buyer aware of the limitations of the computer he was being offered? Was the software adequate for the task for which it was bought? If not, what difficulties were encountered?

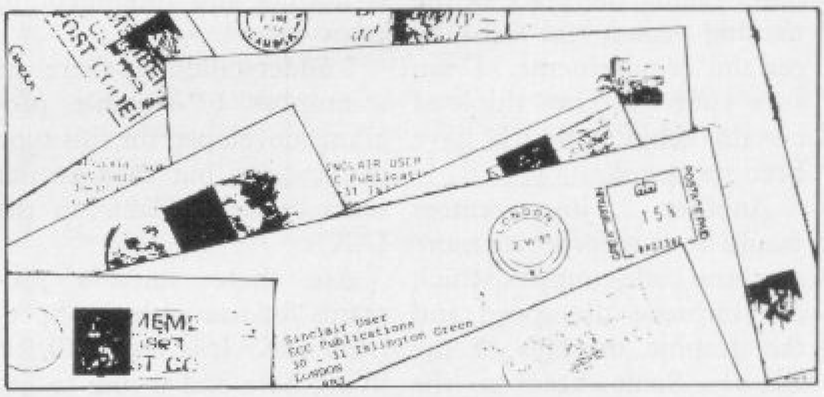
Tom McGowran,
50 Monnow Street,
Monmouth NP5 3XJ.

SU should be in binder

COULD YOU tell me if a binder is available for *Sinclair Users?*

N Taylor,
Bridgend
S. Wales.

● *We are considering making binders available and will keep readers informed.*



Making your ZX-81 organic

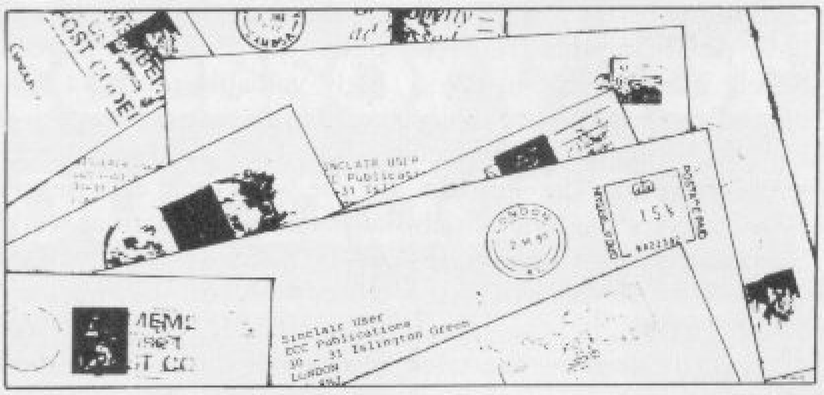
I HAVE found that you can get sound out of a 16K ZX-81 by writing in these lines:

POKE USR 1,1

then press "ENTER" and you will see your screen scattered with squares, so press enter once more and you will see the screen go blank.

If you press keys on the top e.g., 1, 2, 3, low pitches of sound will be heard and if you press Q, A or Z the pitch of the sound will become higher. Therefore the ZX-81 can be used as an organ.

Andrew Mar,
Chorlton-cum-Hardy,
Manchester.



Standards can be improved

HAVING READ articles and typed programs from the two magazines, *Sinclair User* and *Sinclair Programs,* I can safely say that the standard of the two magazines is on the whole extremely high. Occasionally one or two articles and some programs have not been up to the usual standard.

I think the standard could be raised even further by featuring bi-monthly competitions on a certain subject, i.e., a datafile or a computer versus man game — the computer taking the place of the missing person and fulfilling certain requirements. I am sure your staff can think of certain subjects which have been neglected.

Another improvement would be to incorporate more machine code routines which can improve the speed and the graphic displays of the ZX-81. Somewhere in the computer-riddled homes of Britain there must be someone who can supply such routines.

Can anyone supply more two-player games? At the moment the majority of all games — I would say a rough estimate of 78 out of 80 games — cater for a single player.

W M Juned,
Moulton,
Northampton.

● *We are always looking for more complicated games and listings and anyone who has written something like that should send it immediately.*

Aid for deaf requested

I AM retired and British. One of my granddaughters, aged 11, is profoundly deaf—98 percent; she attends a special school and the school and the education authority do not seem to understand the potential of computers in furthering her education. She is normal and intelligent in other ways.

I understand that there are a number of suitable programs developed for this type of handicap but they do not seem to be available in the U.K.

Are there suitable programs for use with the Spectrum 48K? It is very difficult living here and trying to get information.

R Yeats,
Alicante,
Spain.

Useful list of pokes and calls

I HAVE compiled a list of useful pokes and calls to the ROM which all ZX-81 users will find very helpful when programming. They are:

RAND USR 963 — Clears program area
RAND USR 3086 — Scrolls screen
RAND USR 681 — In FAST mode, prevents report code from being displayed at the end of a program
RAND USR 0 — Clears program area and RAMTOP
RAND USR 836 — In FAST mode, loads a program and stops it if it is self-starting
RAND USR 3292 — Equivalent to STOP
POKE 16418,0 — Gives a 24-line screen
POKE 16441,20 — Gives a 34-column screen
POKE 16510,0 — Makes the first line uneditable
POKE 16389,68 — Sets up a minimal display file for 16K users.

Note that the amount of memory the computer has is not important when using these commands.

Richard Wright,
Richmond,
Surrey.

Picking up the points

HERE ARE a few tips I would like to share with other readers. Before playing Jetpac, tape down the "ENTER" key with some adhesive tape. That helps a great deal because it fires continuously and all you have to do is MOVE. In Hungry Horace you can gain a great deal of points by slightly hitting the bell and then moving back. Every time you are under the bell you will hear a "grating" beep. Your score goes up until you move away from the bell.

When Cyber Rats has loaded, you will be asked to enter "2" for a two-player game and "S" to start. If instead you press "CAPS SHIFT" and "BREAK" the program will NEW, together with the USER DEFINED GRAPHICS. Is that a bug in the program?

Farley Thomas,
Egham,
Surrey.

Patterns from E-mode

I HAVE found that on my Spectrum the TRUE VIDEO and the INV. VIDEO commands do not always work. For example, I typed-in a line using INV. VIDEO and closed the brackets and I could not get it back to normal print.

I have found that you can get it into normal print by . . . Getting Extended Mode (E) and press the 7 key on its own, so then after you do that you can get normal print.

You can make patterns using E mode and keys 1, 2, 3, 4, 5, 6, 7, 0.

Sean Simmons (11),
Surrey.

Early retirement for corner man

WHAT HAS happened to the little man on the corner of each page of *Sinclair User?* I have not seen him since the March issue. Is he ill, dead or on holiday? Wherever he is, please bring him back.

Sinclair User is a very good magazine but for two points. First, as many others, I think too much space is wasted on program pages with drawings; second, let us see some decent programs in machine code which permit smooth movement of graphics and the like.

Richard Hardwick,
Chichester,
Sussex.

● *Following the change of layout some months ago we decided that because of lack of space we should give the little man an early retirement, which we felt he deserved after many months of sterling service.*

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(W.A. HACKETT, Harborne)

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48K SPECTRUM ONLY

MANIC MINER *"One of the best Spectrum releases this year"* (Pop Comp Wkly) *"The graphics and sound are both superb"*. (Pers Comp News) Based on the USA arcade chart-topper 'Miner 2049'er': great music, superb graphics as you search through 20 screens – each one a different arcade game. Amazing! Demo mode's your best chance to see most screens. JOYSTIX: Kempston (Bug-Byte) £5.95.

AQUAPLANE From John 'Timegate' Hollis comes a wonderful full-screen arcade game whose sensational graphics are making the competition wonder how he does it! Just water-ski along, avoiding the yachts, motor-boats, rocks, great white sharks etc. Accelerate and watch – it's fantastic! JOYSTIX: Kempston (Quicksilva) £6.95.

JOHNNY REB A new full-screen graphic battle-game. NOT an arcade or adventure game. You fight out a struggle for a river crossing during the American Civil War. 1 or 2 players. Choose your side, equip your army, and fight the battle: great battlefield display. Fight to the death or within time limits as you wish. (Lothlorien) £5.50.

HALLS OF THE THINGS *"Could change the Spectrum games scene overnight . . . technically excellent and dangerously addictive"*. (S. User) Explore a maze, find treasure, avoid nasties . . . BUT this time you can see exactly where you are and the maze scrolls as fast as you can move. Brilliant graphics (try waving your sword about) and 19 command keys! (Crystal) £7.50.

GO TO JAIL *"Has to be seen to be appreciated"* (Pers Comp News). The best computer version of the famous game we've ever seen. From 2 to 5 players (including the Spectrum, at last! It's ruthless but honest) Every original feature is faithfully reproduced and the screen display is miraculous. (Automata) £6.00.

GOLF By far the best golfing simulation we've seen. All 18 holes in clear high-res graphics. Watch – and hear – yourself play. See the ball in flight. 1 or 2 players: choice of 15 graphic clubs: the most accurate on-screen direction indicator we've ever seen. Preview of each hole available in 4 or 5 full-screen sections! (CRL) £5.95.

THE HOBBIT *"Superior to any other adventure game available"*. (Yr Comp) *"Takes first place . . . for quality and value for money"*. (S. User) THE Spectrum adventure of 1983. Free 285-page illustrated book with clues: unique real-time adventure: 80 locations, 30 beautiful full-screen pictures: 500-word vocab: 16-page manual: 40K of program to 4 people 18 months to write! (Melbourne) £14.95.

PIMANIA *"The best adventure game we have reviewed"*. (S. User) *This game can damage your brain"*. (Pers Comp Games) At press-date, you can still win the £6,000 Golden Sundial by solving this wonderfully witty adventure! Brilliant use of music and graphics really shows off your Spectrum. (Automata) £10.00.

BLACK CRYSTAL *"Excellent graphics adventure"*. (S. User) *"Impressed by its sheer quantity"*. (Home Comp Wkly) 180K of program loads from 2 cassettes in 6 chapters. Solve each of the 6 stages to defeat the Lords of Chaos. Real-time monster battles: 16 command keys. Illustrated manual. (Carnell) £7.50.

MAZIACS Brand new, very much enhanced version of the classic 'Mazogs' maze chase. Some of the best animated cartoon graphics we've seen and the most amazing on-screen fights! You feel like cheering when you win! Full-screen shows only 1/50th of the maze: 4 skill levels: choose your own keys. (Dk'Tronics) £6.95.

ANY SPECTRUM

PHEENIX BRAND NEW – THE BEST SPECTRUM 'PHOENIX' YET! A full arcade-action 5 screens. 5 skill levels. Choice of 2 character sets. Demo mode. 100% machine-code for smooth animation of the multi-coloured flappers and their hatching eggs. Really does cram 48K quality into 16K. JOYSTIX: Kempston: AGF (Megadodo) £5.50.

3D SPACE WARS Brilliant 3D space battle that's brand-new! Demo mode: good, clear screen display of instruments: cockpit view fills 2/3rds of screen. Long-range scanner is actually legible! Re-fuelling in space is great – just like the RAF, takes real skill. Defeat the 3D SEIDDAB (geddit?). Great space-flight simulation from a company famous for earthflight simulations! JOYSTIX: Kempston: AFG (Hewson) £6.95.

TRANS AM Brand new! The down-to-earth GT Racer version of a flight simulation. Take your Red Racer (full-screen graphics) all over the USA, avoid the deadly Black Turbos and find the Gold Cups. Playing area is 600 times your screen size! Real-time clock: accurate speedo: controlled acceleration, braking, steering: amazing night driver phase! (Ultimate) £5.50.

JET-PAC *"A classic which should rank with Space Invaders and Pacman"*. (Pers Comp News) *The graphics are superb"*. (C&VG) The fantastic game that blasted Ultimate to fame. Control your test-pilot spaceman as he builds his rocket, fuels it up, explores galaxies. 1 or 2 players. As good as its rave reviews. JOYSTIX: Kempston: Quickshot. (Ultimate) £5.50.

FROGGY *"The game is superb"* (ZX Comp) *"Unreservedly recommended . . . a stunning display"*. (Home Comp Wkly) This frogger is leaps ahead of the rest! Loads in 2 parts: instructions and keyboard demo first, then the game – which uses so much memory you even have to unplug your printer! A classic game, in its very best form. JOYSTIX: Kempston: Quickshot (DJL) £5.95.

JUNGLE FEVER Escape down the pygmy death-run. Smashing full-screen animated graphics as you leap crashing waterfalls, swing across deep pits on a passing liana, dodge spiders and poisoned blow-darts. More thrills in 48K than 16K! Great! (A&F) £6.90.

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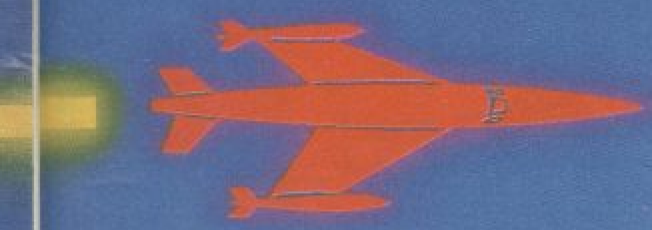
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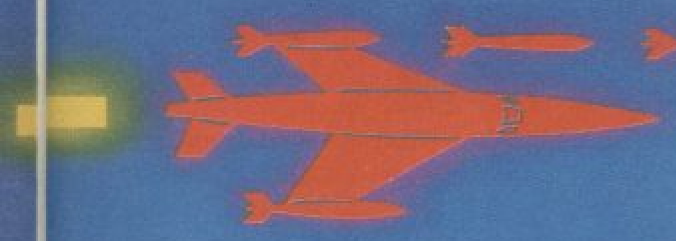
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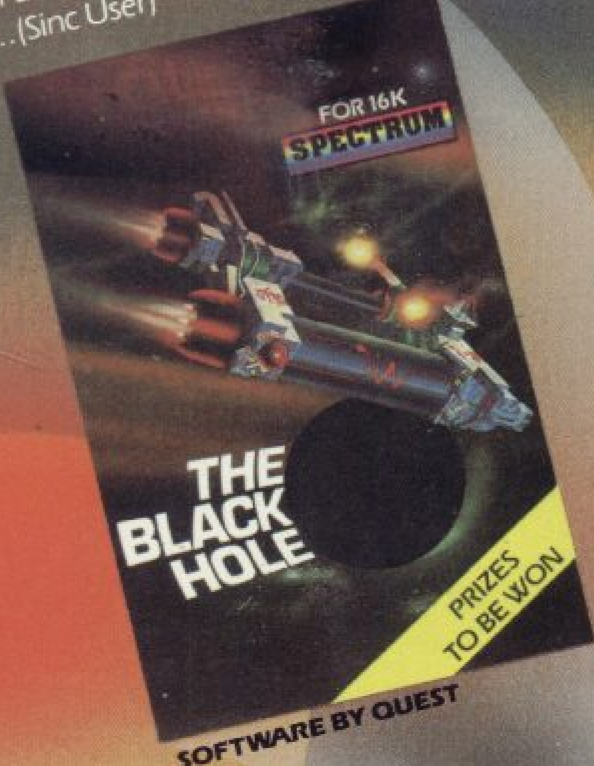
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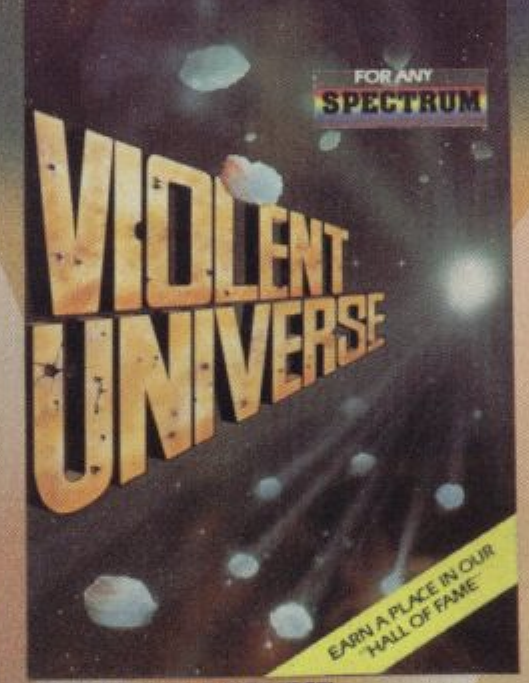
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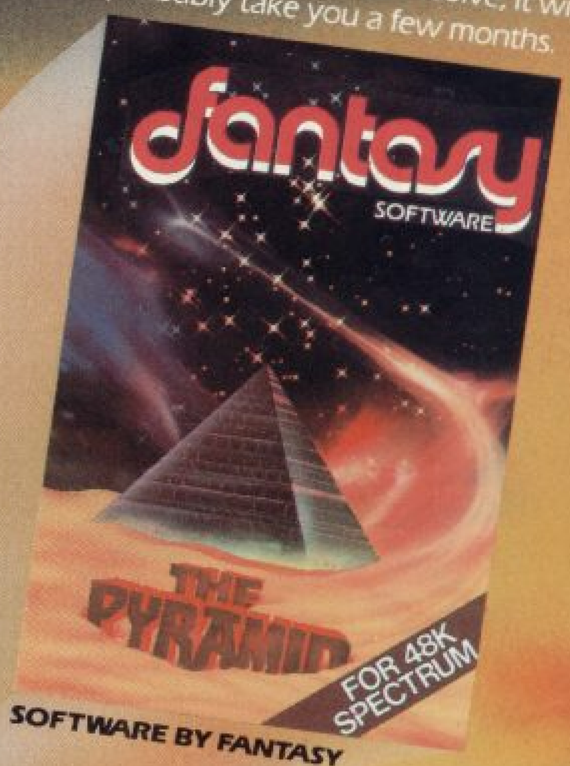
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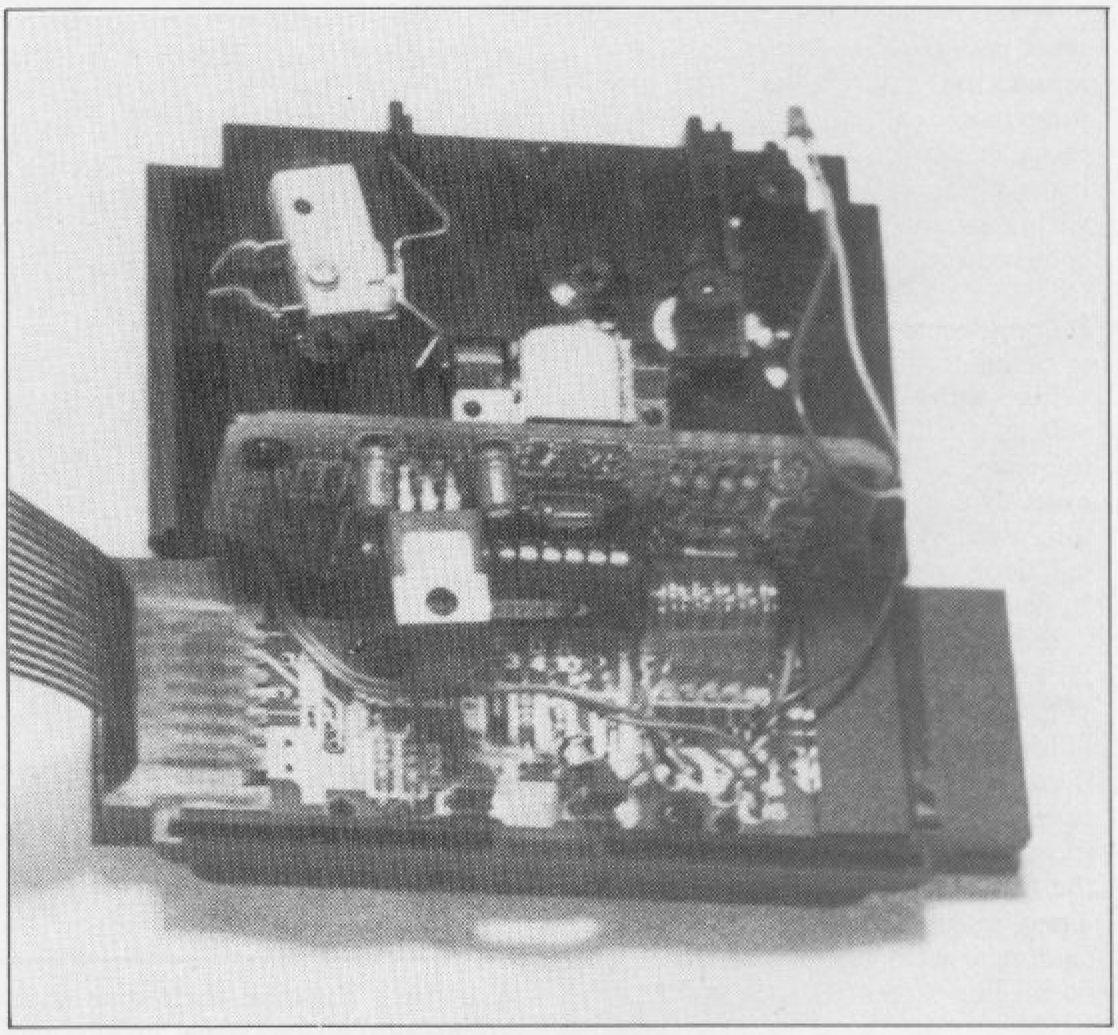
Spectrum receives its biggest improvement

In this special section Stephen Adams reviews the microdrive

THE MICRODRIVE with the Interface 1 module has produced the biggest improvement to the Spectrum yet. It cannot do everything a disc drive can do but it is much cheaper and the interface contains three modules for the price of one.

The interface unit controls the Microdrives and RS232 communications/printer interface and a network which allows you to talk to another 63 Spectrum users. The unit fits underneath the Spectrum and an edge connector under its hood pushes on to the back of the Spectrum.

The unit is provided with two screws which replace two of the original screws in the case of the Spectrum to hold it tight and prevent wobble. It also raises the Spectrum 20 degrees to a comfortable typing angle. That system also applies to the Microdrive which has a plastic plate underneath each drive. That can be re-positioned to screw together two adjacent Microdrives underneath the interconnecting socket to strengthen it.



On the back of the unit are three sockets and a duplicate of the expansion connector, so other devices can be plugged in. Another interface by Sinclair called the Interface 2 will plug in there to give access to ROM cartridges and a joystick interface soon. There is a socket on the back of the unit which looks like an Atari joystick interface but do not plug your joystick into it — it is the RS232 interface and you could damage it.

The RS232 interface is a standard way of connecting printers and other devices like modems which use only one wire to pass data across. Each byte is broken into eight binary bits — see the BIN function in the Spectrum manual — and sent down one bit at a time. That method of swapping information is called serial access and is used on all the Interface 1 devices, including the Microdrive.

That involves timing the length of each bit and so the speed of the RS232 can be set to match the speed of the device from which you are sending or receiving data. Speeds up to 19,200 bits per second — the baud rate — can be set easily by POKEing a number into two new system variables listed in the new manual provided with the interface. Those system variables take up another 58 bytes after the ones listed in the original manual.

The RS232 allows you to feed data in and out over the two data lines TX data and RX data but it also has two other control wires to keep an eye on things. They are called DTR and CTS. They are used to tell the Spectrum when information is ready from the device to which it is connected by using the DATA TERMINAL READY (DTR) input. The CLEAR TO SEND (CTS) output does the same but tells the device the Spectrum wants to send data.

> 'It is assumed that if you want to connect an RS232 device you will know how to use it'

None of that appears in the manual and it is assumed that if you want to connect an RS232 device you will know how to use it. Tips are given such as for setting-up the printer to work the Spectrum but they are all about programming. The socket is not a standard socket, so Sinclair will provide a conversion cable at a cost of £14.95 to a full size 25-way 'D' plug.

The RS232 can be sent two types of data, eight-bit binary codes and seven-bit text-only information which omits all control signals and graphics and expands the Basic keywords to full words. The channel is set to "b" or "t" by the FORMAT "t or b"; baud rate command.

The "b" mode usually is used for sending data which controls the RS232 device and therefore should not be

Continued on page 28

continued from page 27

printed. The "t" mode is for all the information which normally would appear on the screen. Programs and data can be sent over the RS232 interface easily using the command LOAD* and SAVE*. Those and other asterisk commands indicate to the Spectrum that the new 8K ROM installed in the interface is required and switches it in to the ROM area.

It also means that you could use it to write your own Basic commands as any errors, like the asterisk after LOAD, jump to a location in RAM which holds the place of the next machine code instruction. By POKEing that number with the location of your own machine code routine, any errors can be checked for new commands and if a program is running could cause the new command to be done.

Sinclair has made Basic the operating system of all the devices connected to the interface and so you will have to learn to use the channels and streams information contained in the new manual along with the various extension to Basic provided by the new ROM.

Streams are OPENed by using OPEN # number of stream (from 4–16); "n" (or "m" or "b" or "t"); followed by a "name" for Microdrive files, a station number for the network or nothing for the RS232. The n stands for network, the m for Microdrive and the b or t as described for the RS232. They make the device available for reading or writing to the device, but not both. The stream acts as a tunnel or passage to the device — or channel — for a particular purpose; more than one stream may be OPENed to a channel and the screen, keyboard and Sinclair printer can also be used this way.

A data file existing on a Microdrive, for instance, can only be read. If you wish to put in more data or change the contents you will have to transfer the whole file from one stream to another, creating a different file and making the changes as you go. Programs, however, must be loaded into memory and then SAVEd back on to the device — if possible — in full, using the entire 48K or 16K of memory; it is not possible to INPUT parts of a program.

The "if possible" occurs because the designer of the program would have to let you return to Basic to SAVE it. Cassette recorders can still be used as normal using SAVE, LOAD and MERGE.

All the devices use RAM to store the data in buffers — 595 bytes for Microdrives and 276 bytes for networks — which take up more RAM. They are allocated space after the system variables so that the start of the Basic program varies depending on how many channels are being used at a time.

OPEN # creates a new buffer and CLOSE # closes the file by writing the whole buffer to the device and then removing the buffer from the memory, freeing the RAM for something else. So using a number of streams means having a smaller program, as up to 595 bytes is needed for each stream. That means that all machine code must be stored above RAMTOP and not in the program —in a REM statement — otherwise the address of the routine will vary depending on what part of the program you are in. Apart from streams the extra commands are MOVE, ERASE, FORMAT and CAT. MOVE transfers a file of information — not a program — from one device to another.

A good example might be a Spectrum on the network wanting to access information on the Microdrive. CAT provides an alphabetical list of files on a Microdrive showing their names and the amount of free space in kilobytes. Files can be protected from CAT by including CHR$(0) as the first letter in the name. As with cassette files there is no foolproof way of protecting anything on a computer.

> 'You will have to learn how to use the channels and streams information in the new manual'

ERASE allows you to clear out the file named on the Microdrive and FORMAT allows you to set up the network, Microdrive or RS232 device so that it can be used. Blank Microdrive cartridges must be FORMATed to give it a name and set a catologue. The network must be given a station number, which can be changed at any time, and the RS232 must be set to the correct speed — only one speed is allowed — as well as indicating whether it is a text ("t") or byte ("b") channel.

INPUT, PRINT, LOAD, SAVE and VERIFY have all been extended to work with streams using an asterisk after the command. MERGE* cannot be used, however, on data file or on any program having saved with a SAVE-*...LINE command, thus providing some software protection in the short term.

The network provides connection for up to 64 Spectrums, via a two-metre-long, two-wire audio lead with 3.5mm. jack plugs on, at 100K baud per second. Anything attached to a stream may use it to transfer programs, data or just INPUT and PRINT statements to one particular station or to broadcast it to every station listening on the network.

INKEY$* may also be used to get individual bytes. The allocation of a station name is spread orally to the various users on the net and more than one station can be allocated the same station number, so you can "listen-in" so long as you know the station number.

The station-to-station contact is by "pooling" and requires a response from the receiving Spectrum before the information is sent. If no reply is received the sending Spectrum will "lock up" and the border will be black. The BREAK key, however, still works.

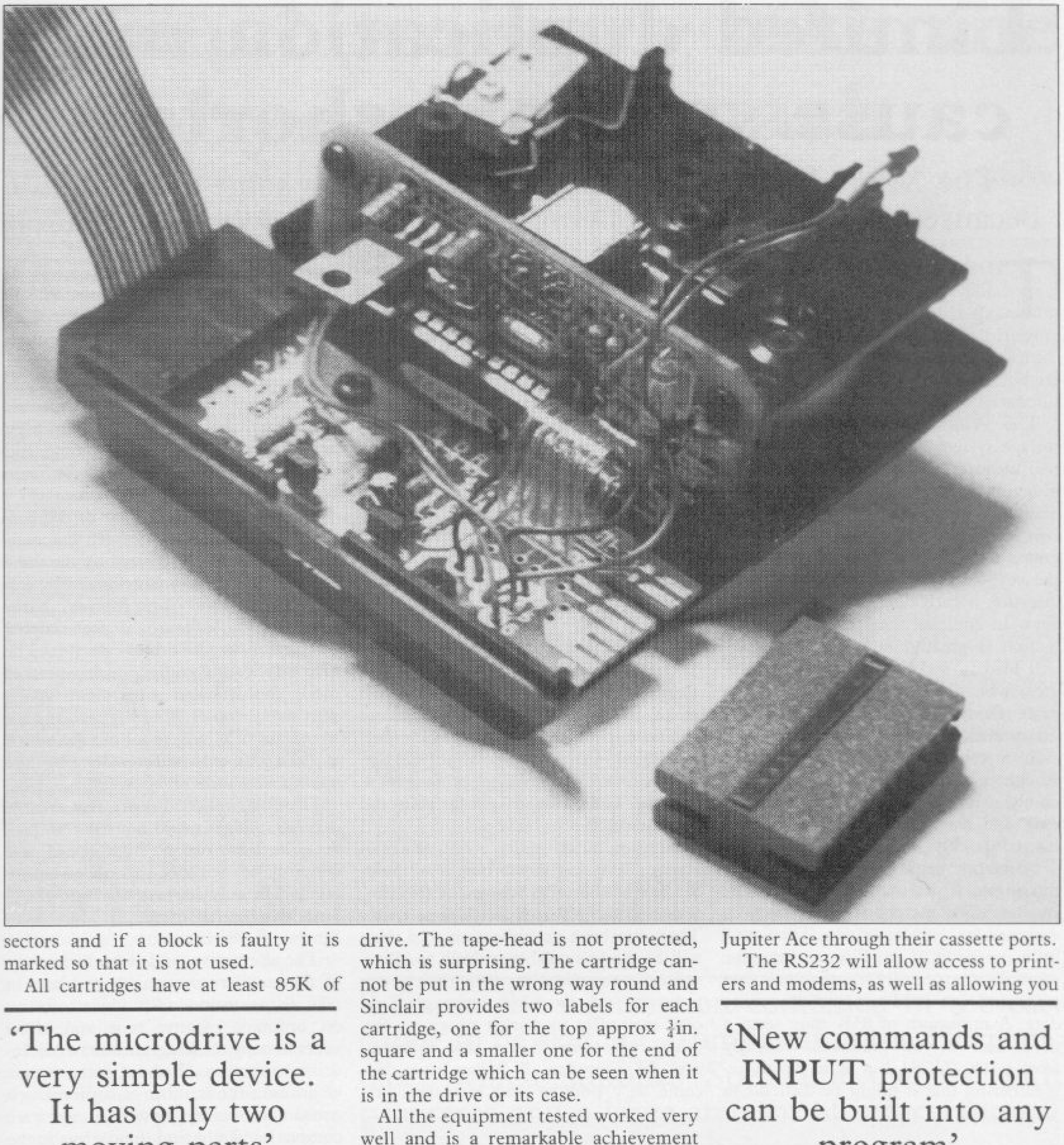
Broadcasting information does not do this as it is sent only once and is then forgotten; no response is required. It has not been possible to test that, apart from seeing demonstrations, as we could obtain only one interface but the demonstration was impressive, as it transferred a screenful of data in three seconds — a rate of 2K per second.

The Microdrive is a very simple device. It has only two moving parts — three if you include the write-protect switch. The motor and a ratchet which stops the motor reversing are the only moving parts. The tape-head is fixed and two springs either side, which bring the tape to the head and not the other way round, eliminate the need for alignment of the head.

It acts like a very fast continuous loop tape recorder running past the head at 30 inches per second — 16 times as fast as the normal cassette recorder. When the drive is running a red warning LED shows at the front of the drive; the cartridge should not be removed while the LED is on.

The tape-head has two tracks and is switched by software at the end of one track to the other, giving a continuous loop of 40 feet of tape track. The tape can be protected by pulling off a tab of plastic with a screwdriver which then means it cannot be over-written.

The tape is made of 1.9mm. wide 23-micron thick video tape, which is slightly thicker than domestic home video tape. Sinclair claims that more than 5,000 operations can be done on the tape before it wears out. The tape format is in blocks of 512 bytes called



sectors and if a block is faulty it is marked so that it is not used.

All cartridges have at least 85K of space but the amount varies depending on the number of sectors damaged by the manufacturing process. With up to eight Microdrives connected to one Spectrum, 860K can be connected at one time.

'The microdrive is a very simple device. It has only two moving parts'

The drives are very reliable and I had no failures at all using the demonstration cartridge supplied. The cassettes are in thick plastic jackets to protect them from dust and they have to be removed to fit them into the Microdrive. The tape-head is not protected, which is surprising. The cartridge cannot be put in the wrong way round and Sinclair provides two labels for each cartridge, one for the top approx ¾in. square and a smaller one for the end of the cartridge which can be seen when it is in the drive or its case.

All the equipment tested worked very well and is a remarkable achievement for such a low cost.

There have been no restrictions on hardware add-ons which were not already known and the fact that ROM errors can be intercepted by software will open a new field for software companies. New commands and INPUT protection can be built into any program, machine code or Basic very easily.

Networking should be very useful for schools. A printer server Basic program is included in the manual. It should also be possible to connect other machines to the net such as the ZX-81 and the Jupiter Ace through their cassette ports.

The RS232 will allow access to printers and modems, as well as allowing you to transfer programs between other computers — such as the BBC — which have an RS232 interface.

'New commands and INPUT protection can be built into any program'

The offer is at the moment limited to registered Spectrum users at a cost of £49.95 for each Microdrive, £4.95 for each cartridge and £29.95 for the Interface 1. If you want to buy only the Interface 1 it will cost £49.95 and £4.95 postage on top of that must be included in any order. The Microdrive cannot be used without the Interface 1.

Limited duplication may cause software shortage

The Microdrive could cause software houses some problems because of the dearth of copying facilities. Mike Johnston reports

THE RECENT announcement that the ZX Microdrive will shortly become available, if only in limited supplies, was music to the ears of many patient Spectrum owners but could cause some headaches to software houses.

The advantages of this new mass-storage system are readily apparent. It will mean an end to plugging and unplugging leads, switching tape recorders manually and so on, as the whole process is under software control. Programs may be saved and loaded from the keyboard with no more effort than inserting a cartridge and pressing two keys. In addition the transfer of information is greatly increased. Programs will load in seconds, rather than minutes, which makes the machine much more flexible and useful. At last it makes sense to catalogue books, records, club membership and so on on the computer because the space is available on the Microdrive for a great deal of data and the information can be retrieved quickly.

Problems begin to arise with the cartridges which are mini cassettes, smaller than matchbox size specially designed for the Microdrive. They are a little expensive at £5. Floppy discs, for example, are typically less than half that price and can hold considerably more data. A minimum of 85K may seem a good deal if you graduated recently from a 1K ZX-81 but it is worth remembering that it might be difficult to get two programs the size of The Hobbit on a single cartridge. In practice it is essential to keep back-up copies of important programs and the number of cartridges needed tends to multiply.

The cost may be relatively high because production runs are being kept short until the demand becomes clearer. Alternatively Sinclair may be discouraging sales until stocks can be built up. In either case the price might be expected to fall within a few months. If it does not, then the customers will have to pay considerably more for software on the Microdrive than they do at present for a cassette. The profit margin for software houses would also be less.

> 'Cartridges at £5 are a little expensive. Floppy discs are less than half that'

The second difficulty is one of availability. It is early yet but at present Sinclair is the only source for the cartridges and the fine tape which is used. There has been no indication that they will be made available in bulk to allow software suppliers to sell their own programs on cartridge, although Sinclair may offer to market programs for other companies. Again that problem may be overcome if Microdrives become very popular and cartridges are produced by several manufacturers. It would be a great pity, however, if Sinclair restricted the cartridges to its own programs or a limited selection from other software houses.

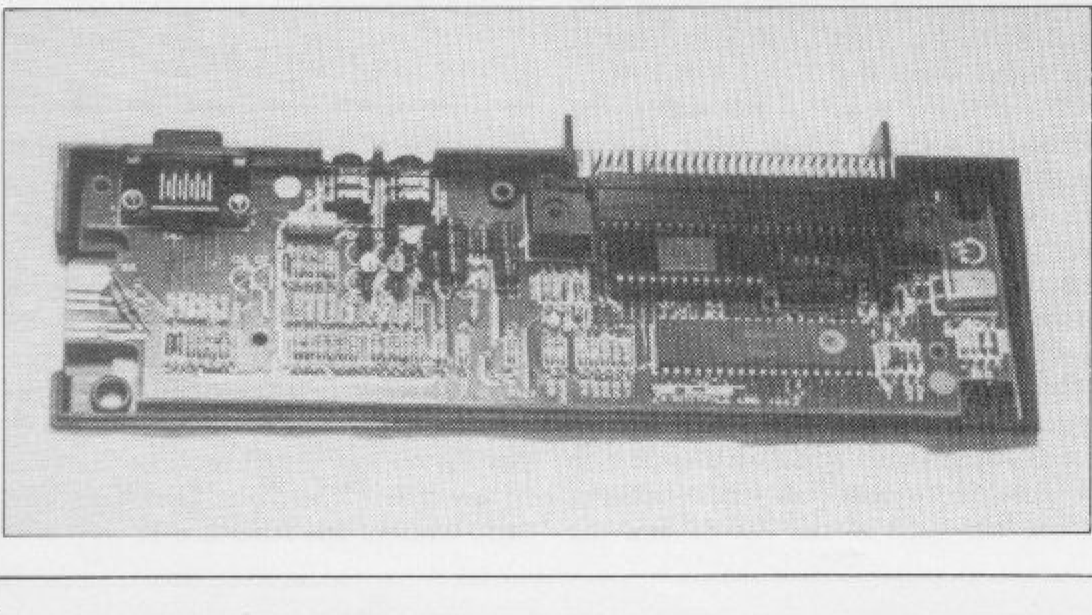
The success of the Sinclair machines lies to a large extent in their intrinsic merit but their popularity has been aided by the very large volume and variety of software produced for them by independent software houses.

Another problem is that of duplication. Not too long ago much commercial software was produced by the same process as ordinary Sinclair users employ to copy their own programs. Nowadays most software is not copied directly on to individual cassettes. The tape duplicating companies have rather more sophisticated equipment which puts many copies of a program, at high speed, on to a long spool of tape which is then cut into shorter lengths and spliced into individual cassettes.

The first indications are that Microdrive cartridges could not use that process, at least not at high speed and certainly not without specialised equipment. The only copying machine of any kind there is at present is owned by Sinclair Research.

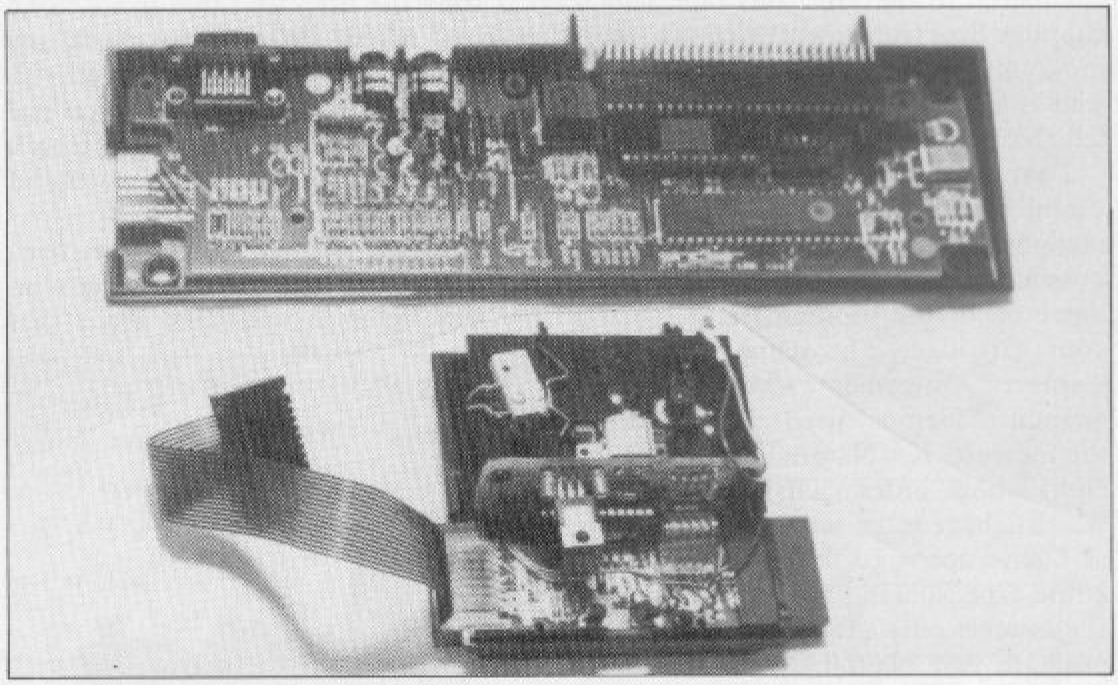
The alternative, and one which many of the smaller companies are likely to take, is to continue to produce software on ordinary cassette tape and allow users to copy the programs on to Microdrive cartridges. Without some means of limiting the number of copies which could be made, however, software companies would find themselves in the same position of vulnerability to piracy they have spent much time and effort trying to avoid.

Those problems are not immediate, as it seems unlikely that there will be a big demand for Microdrive software before the early part of next year, when the devices begin to become generally available. What seems clear is that it is in the long-term interest of all groups, including users, that sufficient technical information is made available to enable good software to be produced for this exciting new development.



Manual workers take the step-by-step approach

All new extensions of home computing need careful advice to show how they can best be used. Rebecca Ferguson reports.



AFTER THE YEAR of publicity I somehow expected something bigger than the chubby, RAM pack-sized Microdrive and the tiny information-holding cartridge which resembles nothing more than an after-dinner mint. Like the Spectrum, however, and unlike the ZX printer, the Microdrive seems firm, reliable, and disinclined to fall to pieces at the slightest provocation.

Chapter one of the manual is concerned with the interface. Clear instructions and diagrams show how to fit it firmly to the base of a Spectrum. Two screws must be removed from the base of the computer and, despite unnerving moments when approaching that piece of machinery with a screwdriver, they were removed easily enough and the interface screwed in quickly.

I proceeded to chapter two, which deals with setting-up the Microdrive. It connects to the interface with a ribbon cable — again very easily. The moment of truth was when I loaded the demonstration cartridge which acts, as the Horizons tape did, as an introduction to this new Sinclair product. As instructed I entered NEW and RUN and encountered my first error code of the day, "Microdrive not connected". It seemed to be but I unplugged everything, started again, and was rewarded with the screen display "Welcome to the ZX Microdrive".

I went on to break into the introductory program to examine the Basic listing. Trying to return from the listing to the program, though, produced another error code, and once again I had to start from the beginning.

Reading about the interface and Microdrive before their launch I gathered that they offered four major advantages — rapid information storage and retrieval, memory extension, the ability to link my Spectrum to one or many others, and the opportunity to link many other pieces of equipment to my computer through the RS232 interface. The demonstration tape elaborated on that information.

Section one gave information about The Net Game. That involves linking two Spectrums for their owners to play a simple game. It was then that I realised that it was impracticable. None of my friends has an interface or Microdrive and are unlikely to have during the next year — until they become freely available and probably cheaper. One advantage of my new equipment therefore was shelved for a year.

Section two was likewise shelved. It was concerned with making a Spectrum with a printer connected to its RS232 interface print-out files for any other Spectrum linked to it. Section three, which deals with the demonstration program, and chapter four, which covered the initial screen display which I had seen, could be looked at quickly, and I moved to the next section, which demonstrated the use of a large file.

The program which could be RUN at that point provided an index to the extensions to Basic which are used by the Microdrive. The information was stored on cartridge and I had only to type-in an appropriate keyword for its definition to be called from the data store. I examined several definitions before typing-in a keyword not specified on the index. An error code resulted and attempting to re-load the entire program produced the puzzling report "Microdrive not connected".

Returning at length to the menu I moved to the next section. Loading the program proves that your Spectrum can READ from the Microdrive; the section tests that it can also WRITE to it by SAVEing, VERIFYing and ERASEing the demonstration program. Those three tasks took 35 seconds. The normal yellow/blue, blue/red lines of a recording Spectrum were replaced by flashing yellow and black.

> 'I found the information contained in the cartridge to be sketchy. Compared to the Horizons tape, which supplies Spectrum owners with programs and a large amount of information, I found that it was disappointing.'

The last section of the demonstration program dealt with errors which might result from the use of a Microdrive. I expected some detailed analysis of report codes and was disappointed to see only two screens of simply-written de-

Continued on page 32

Continued from page 31

scription. Apparently errors in READing affect LOADing time and are known as Soft errors, while mistakes made in WRITEing, due to such things as a mistreated cartridge, are known as Hard errors. Thus I was given names for my mistakes but no suggestions as to how they could be corrected.

In all, I found the information contained in the cartridge to be sketchy. Compared to the Horizons tape which supplies Spectrum owners with several programs and some useful routines, as well as a large amount of information, I felt that it was disappointing.

I returned to the manual, to find a useful fact about this type of information storage. By entering CAT 1 it is possible to bring up on screen a catalogue of all the programs and files on your cartridge. The name of each is displayed, together with the total amount of memory used, rounded-up to the nearest K. Names are stored in alphabetical order. That is a facility which I have often wanted on cassettes as I have spent 10 minutes playing an entire tape, looking for a lost program. It also takes only a few seconds so that a program can be found and LOADed within a minute.

I followed the instructions and succeeded in LOADing a short program on to cartridge and retrieving it. I ERASEd it and SAVEd it once again and then tried with a 5K program of my own which I had recorded previously on cassette. To LOAD it from cassette took 40 seconds. Recording it on the Microdrive took 10 seconds and re-LOADing it only six seconds.

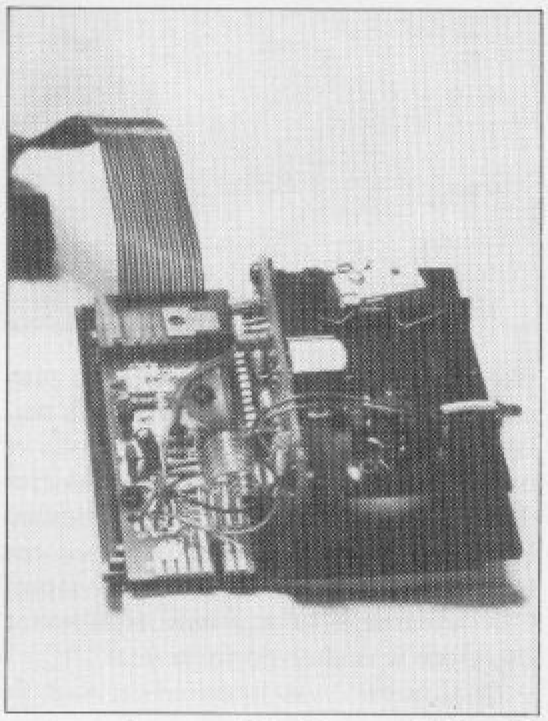
All blank cartridges must be FORMATed before they can be used. That allows you to name them and the computer to identify any areas which cannot be written to or read from. It is also a quick way of deleting all information on a cartridge. Typing CAT at once reveals the memory capacity of the cartridge. The manual claims that capacity never falls below 85K and mine was well above that figure, at 90K.

So far I had found all the information given directly applicable. Chapter five of the manual deals with data, channels and streams, and I was not sure what use I would be able to make of them. The general information at the beginning was clear. To summarise — data can come from and be sent to CHANNELS. They include printers, Microdrives and the keyboard. The routes along it are called STREAMS and the Spectrum has 16 of them, four of which are already in use and 12 which are free.

Information in a cartridge is stored in a file. That must be OPENed before the information is entered and CLOSEd afterwards. The manual gives two short programs for doing it. Open the file, store the numbers 1 to 10 with their squares, close the file, and then RUN another program which prints "The square of is ". The blanks should then be filled with information stored in a file and attached to a specified stream.

I tried the exercise three times to no avail. I asked a friend to check my entries and tried again. I changed sections of it around and produced several error codes at the bottom of the screen which I had never seen previously. I gave up and went to bed.

The next morning things were clearer. I realised that I had made an error on my first attempt and then from that



point, whenever I had opened the file the computer had read faulty information from it instead of writing new information. I deleted the entire file, tried again, and it worked.

A simple error I had made had left me floundering for well over an hour and for the first time I wished that the simple, straightforward manual was more detailed and that it suggested possible errors and how to correct them.

Having managed to enter the example in the book I was inspired to enter my own data and my own program to read from it. Half an hour later the computer printed "1" on screen which was the answer I had been looking for and simultaneously produced another new error code "Invalid Stream Number". As with the previous error code "Microdrive Not Connected", which had appeared periodically the day before, that error code seemed to be unfounded. I decided to move to the next chapter.

The Local Area Network was introduced in chapter seven. It appeared to be very useful. Up to 64 computers can be linked. Programs can be transferred from one to another, meaning that only one person on the network has to type-in a program. It is invaluable for use at user clubs or schools, provided your computers are no more than a yard apart. Useful though it seemed, it was at that time useless because I knew no-one else with an interface.

Chapter eight dealt with connecting equipment to the RS232 interface. I had no equipment to attach and moved on. Sharing a printer among users on a network was similarly passed over, taking me to appendix one — the Net Game specified on the demonstration program. Following appendices give the system variables used, the Microdrive channel, the network, RS232 connections, error codes, and the extension to Basic used.

There seems to be little point in Spectrum owners who use their machines primarily for writing short programs of their own and RUNning professional software buying the Microdrive. The large memory storage available seems to be aimed primarily at skilled programmers and those who are using their Spectrums for business purposes. The fast LOADing and SAVEing is good but will make little significant difference on any but the longest programs.

On a professional game the time saved would be appreciable but that would involve the difficult and dubious task of copying copyright material from cassette to cartridge. In any case, the price of almost £100 for Microdrive, interface, postage and packing is too much to spend if all you can do with it is SAVE a few seconds here and there.

It is better to wait a year until Microdrives are freely available, together with compatible hardware and software. A network of computers opens a wide range of possibilities, allowing programmers to work together, to co-operate and to learn from each other, while avoiding time wasted on typing-in programs LOADing, and SAVEing them.

Software will presumably appear making full use of the Microdrive capabilities. None of that can happen, though, while only a few thousand people scattered across the country have Microdrives. So do not be too despondent if your name is not on the magic Sinclair list. Unless your friend's name, your neighbour's name or the name of someone you can contact is on that list as well, you could save your money.

VALH

48K SPECTRUM



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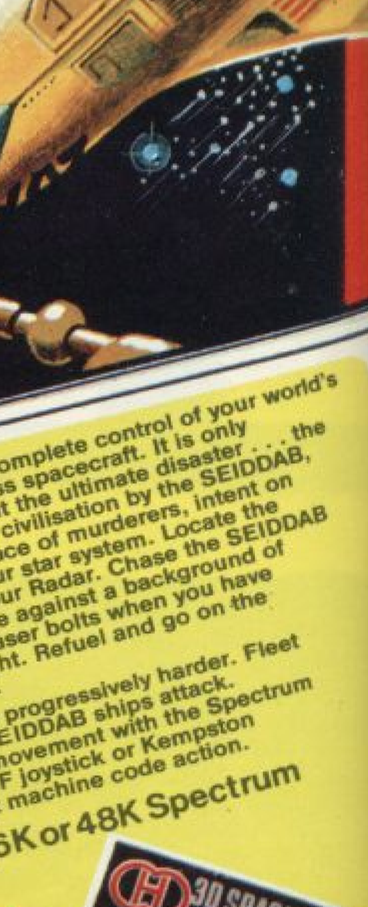


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Graphics get poor manual

ONE OF the questions which users of the ZX-81 often ask concerns the use of high-resolution graphics on the ZX-81. A new software-only package has just been produced which will provide eight hi-res commands with a screen grid resolution of 192×256.

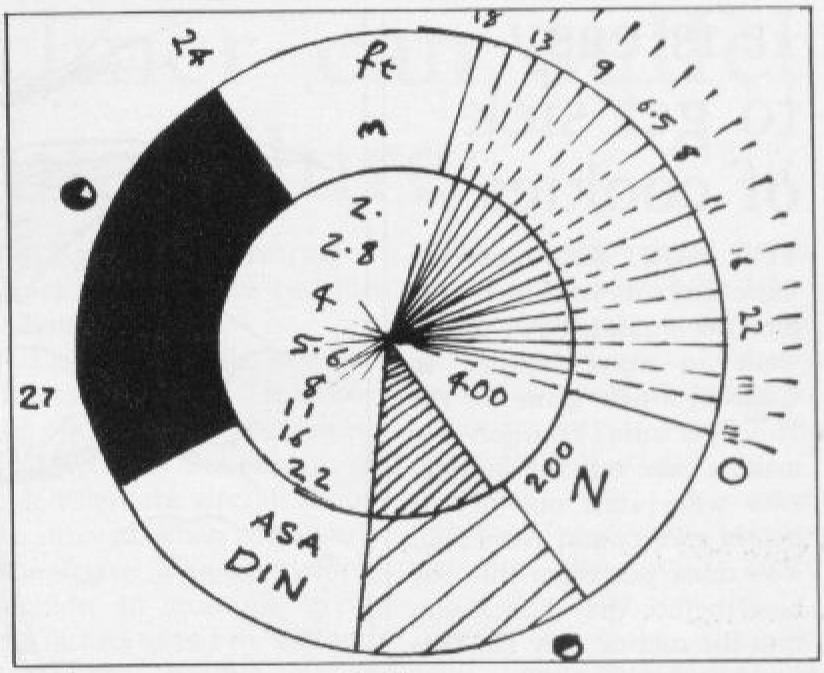
The routines in the package will allow you to draw circles and lines on the screen, as well as defining your own characters. It provides most of the hi-res capabilities of the Spectrum, except for colour.

The program is slow compared to the Spectrum and it can take up to half an hour to draw complicated shapes and patterns. When you have constructed a screenful of graphics you can save the results, to be loaded later.

Like so many packages of its kind, its manual seems to have been written by the programmer. Very often a person who knows a good deal about a program is not the best person to write the manual to explain things to someone who knows nothing of the subject.

The manual is pocket-sized and gives a brief explanation of the hi-res commands available. It does not provide sufficient examples of the commands and half the manual is devoted to blank paper, where the user can make notes. It would have been better if more instructions were included in those spaces.

The 16K ZX-81 high resolution package can be obtained from most computer branches of John Menzies. It costs £5.95.



Photographic memory

SPECIALIST computer applications are difficult to learn about but when such a program is produced it is usually written by experts and is good at doing its job. That is true of **Protim,** a photographic process timer for the 16K ZX-81. A developer can enter the processes and timings necessary for the developing of a photograph. When the data has been set up, option one on the program main menu can be selected to start the timing of a process.

The timer is displayed as a camera with a digital clock set into the centre. The time decreases on the display at approximately five-second intervals. When the time is up a banner saying "process complete" is scrolled on and off the screen until a return to the menu is requested by the user.

There are two disadvantages to the program. The first is in the timing, as the clock can be set using only multiples of five seconds. The other is that the developer will not be able to leave the screen display to do something else.

An application of this kind would have been better applied to a computer which has sound capabilities, such as the Spectrum.

The computer could then inform the user of the end of the process with a buzz or a click.

Apart from those small quibbles the program performs its task well and should be useful to a photographer with a ZX-81.

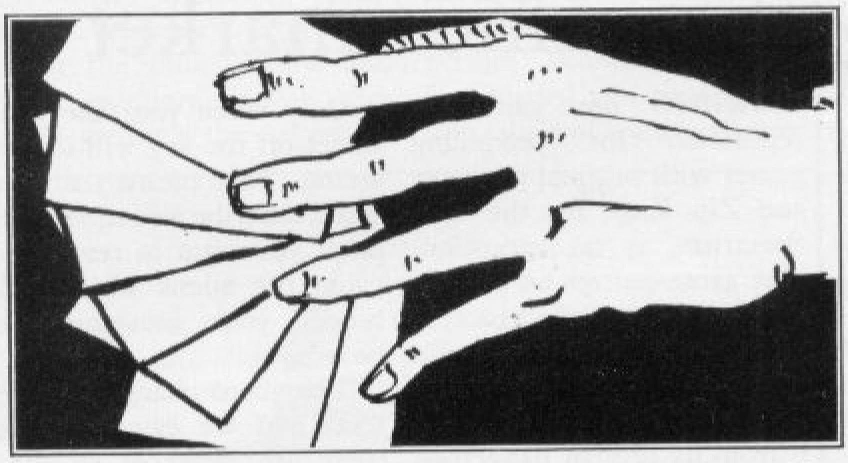
Protim can be obtained from Photosoft, 32-34 Albert Street, Fleet, Hampshire, GU13 9RL. It costs £5.95.

Perfect machine ruins play

MANUFACTURERS of software, especially those new to the scene, still insist on producing traditional card games. **Eight,** for the 16K ZX-81, is yet another example of the attitude.

The game is usually played by two human opponents. Seven cards are dealt to each player who must pick up and discard cards during the game in an effort to collect, and play, a series of four eights. The winner is the one who manages to find all the eights and the final score is determined by the number of cards left in the loser's hand.

In the ZX-81 game the computer takes the part of your opponent in a series of games. To win a series you must accumulate 100 points or more. The computer plays a good game and we were not able to beat it, although we



were very close with two eights in our hand.

In view of the difficulty of beating the machine it would have been a good idea to include several levels of play, if memory space allowed. Unfortunately the computer seems too intelligent.

It is as if the author had set out to prove that the computer could be made to play without human error. What should really be on the programmer's mind is to achieve a balancing effect to give the human some hope of winning. If that is not done, there is no point in playing.

Eights is well-presented but lacks imagination. That is unfortunate as the program is efficient and well-structured. A game, however, does not sell on its code structure.

Eights can be obtained from Hardy Software, 18 Velindre Place, Cardiff, CF4 2AN. It costs £4.

It is easy to get sick of cookies

YOU MUST flour-bomb the ingredients of your new cake into the mixing bowl if you want to serve dinner in **Cookie,** a new game for the 16K Spectrum. Your job is to make a cake but the ingredients will jump out of the pantry and try and avoid you. You must put them into the bowl before they knock you into the mix or they fall into the dustbins on either side.

As with all Ultimate products so far, the graphics are of arcade and cartoon quality. The game concept is novel but it is easy to lose interest after you have played through a few levels of those evil ingredients.

When you have been playing the game for a short time you will begin to see that it is easier to play than you first thought. We found that by staying above the mixing bowl we could bomb through several levels of the game before being hit by a pike bone. The game could have been made more difficult at the start so that players do not get used to it so quickly.

Cookie is on first impressions everything that you could ask for in a game. The graphics and sound are superb, the concept is original, and the presentation is professional. The customer will be drawn to it because of those aspects but may feel cheated after two playing sessions.

Cookie costs £5.50 and can be obtained from Ultimate Play the Game, The Green, Asbhy de la Zouch, Leicestershire LE6 5JU.





Limited terror in 3D

MELBOURNE HOUSE has taken its time in releasing **Terror-Daktil 4D** for the 48K Spectrum. The reason may be that the company wanted to produce a program which is up to the standard of The Hobbit but that adventure is a difficult act to follow.

The game displays a three-dimensional landscape over which the terror-daktils fly in their attempts to destroy you. Your cannon and cannonballs are ready but you have to hit the creatures in the body if you are going to score.

The bodies of the birds are difficult to hit when they are in the distance as they look like over-sized space invaders.

The best part of the game is when the birds swoop from formation and dive at you and your thimble-sized cannon.

Once the action starts you will have your hands full with birds swooping from nowhere. We were surprised to discover that you can hit a bird even if your cannon shot is too high in its trajectory. That effect is a mark against the game but is necessary as the cannon will not move very far up or down.

The three-dimensional effects are interesting but at the beginning of the game is a three-dimensional sequence which is unnecessary and tedious to watch.

When you start to play the demonstration mode, which is more than a minute long, it is very dramatic and picturesque but it can become monotonous if you want to get into the game.

Terror-Daktil 4D is available from Melbourne House, 131 Trafalgar Road, London SE10. It costs £6.95.

Imagine zip zaps the games market

IMAGINE has gained a reputation for producing games with original concepts and **Zip Zap,** for the 48K Spectrum, is no exception. The game centres on a robot which is the last of its race. It must collect power cells which are used with a time transporter which will extract it from its present dangerous situation and you into the next level.

It would be an understatement to say that the graphics and sound are superb. Unlike previous Imagine games, Zip Zap has a depth of concept which should keep you playing for hours.

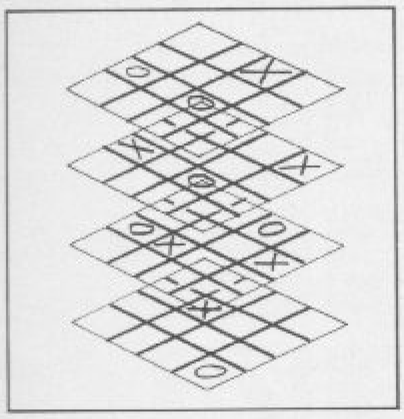
The controls of the robot are difficult to understand at the start, until you realise that the left button will make it arc left and the right key will make it arc right.

Only when you take your finger off the key will it stop arcing. That means that you could describe a complete circle if you want to reverse to avoid the aliens which will hinder your movement at each level.

The aliens change on each level and we calculate that there are 32 types of alien which you must encounter before you return to the first type on level 33.

That means you will have to do plenty of playing to discover all of the alien types and that is what makes the game so compulsive.

Zip Zap is an excellent arcade-quality game. It can be obtained from Imagine Software, Masons Buildings, Exchange Street East, Liverpool L2 3PN. It costs £5.50.



Old game is re-vitalised

NOUGHTS AND CROSSES is better-played on a piece of paper and not with a computer. Artic Computing has realised that and gone one better than the usual three-by-three board in **3D Quadracube** for the 16K Spectrum.

The game has a four-by-four board but it is also has four slices, or levels, on which to play. The slices are displayed in high-resolution during play and as each block is filled by a player's piece it is coloured either blue or red instead of the usual noughts and crosses. That is something you cannot do on paper.

The program gives the option of playing with the Spectrum as a partner or with another human. The computer is difficult to beat as it has a better memory for numbers and can cope better with the extra dimension. Our best score was a thrashing in 17 moves and the worst was another thrashing in seven moves.

3D Quadracube has more of a hold on the player than simple noughts and crosses or connect four. It is an irritating game as you start by knowing that the computer has a better chance of winning than any player. That does not detract from the game, however, as it makes it all the more challenging.

3D Quadracube can be obtained from Artic Computing, 396 James Reckitt Avenue, Hull, N. Humberside HU8 0JA. It costs £4.95.

Basic Airliner can suffer from input failure

A FEW MONTHS ago *Your Computer* published a flight simulation program for the 16K Spectrum. Protek has since taken over the program and released it under the title of **Airliner.**

The program is very good considering it is written mostly in Basic. The display shows all the flight instruments and there is no view through the aircraft windscreen. The only outside view is when you are preparing to land and the level indicator disappears to display a rough 3D representation of the approaching runway.

That effectively means that you are flying blind, and looking at the instrument panel all the time becomes tedious.

The program is excellent in other respects. It allows the pilot to define wind speed and direction and even to decide where the aircraft should be situated when the simulation starts. The instructions include an example giving the factors to put the aircaraft on a path straight for the runway.

It is not simple to put down the aircraft from that position but by using the co-ordinates you will have some idea of what happens in a crash landing.

While the program is well crash-proofed, some extra care should have been taken where numeric inputs are made by the pilot. Numeric variables are used and if an incorrect key is pressed the program will crash.

When you are asked whether you want another attempt you must make sure that you put in 'Y' or 'YES' or the computer will stop. There is no room for errors in that department.

Airliner is available from Protek Computing Ltd, Clydesdale Bank Building, High Street, South Queensferry, Edinburgh EH30 9HW. It costs £5.95.

Good idea lacks thought

YOU ARE invited to spend an evening with the evil wizard Cinslair and his many denizens in a new game for the 48K Spectrum, **Wizard's Warriors.** You must shoot the blue, yellow and white warriors as you progress through the crypts of his castle and confront the wizard at the abyss between this world and Hell.

The game sounds fascinating in theory but the Abersoft implementation is less than perfect. When the game is first loaded you have the option either of reading through or skipping the instructions. One press of an incorrect key and you will be left with no idea of the control keys or how to play the game. There are no instructions on the cassette insert, despite the fact that many players often need a crib sheet to refer to if their fingers stray from the correct keys.

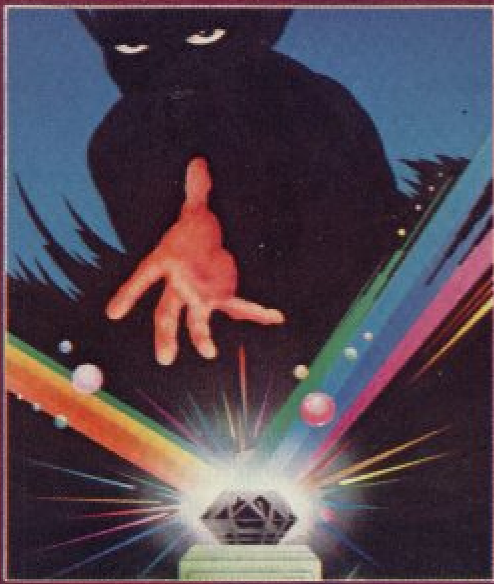


The instructions are displayed on three screens before play. That is possible because each screen has been tightly packed with words. It makes comprehension very difficult.

The last page of instructions shows the keyboard configuration. It can be easily missed if you keep your finger on the key too long when changing from one page to the next. The keys have been made too sensitive and the only way to return to the instructions is by re-loading the game.

The Wizard's Warriors costs £4.95 from 7 Maes Afallen, Bow Street, Dyfed SY24 5BA.

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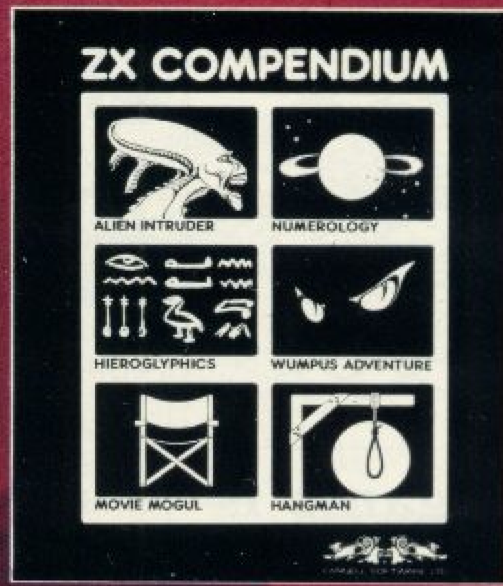
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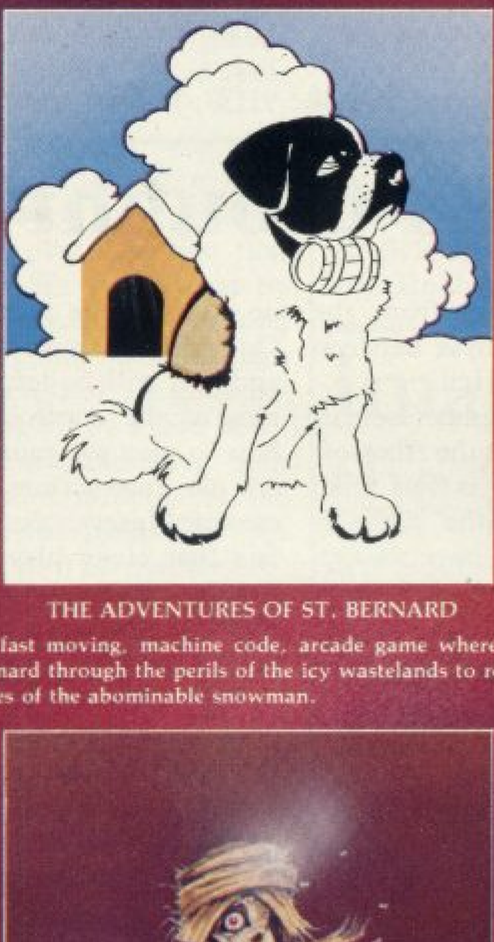
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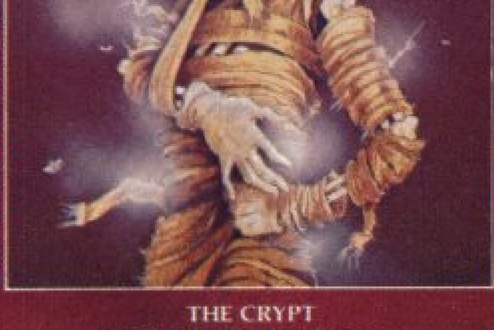


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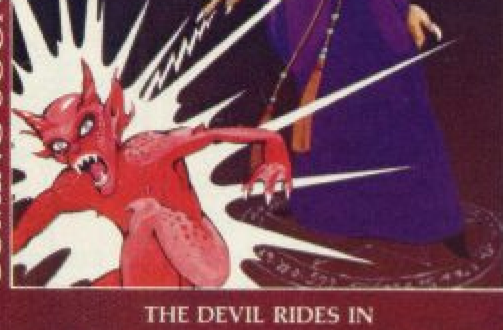
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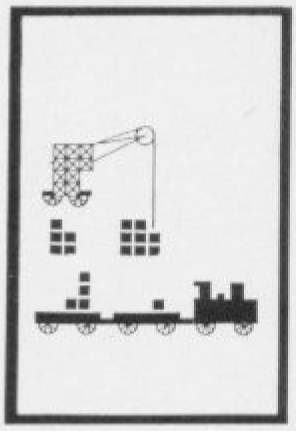
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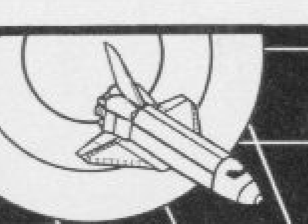
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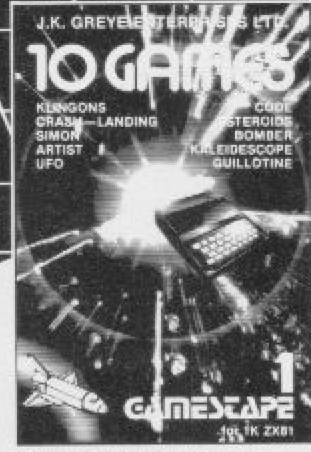


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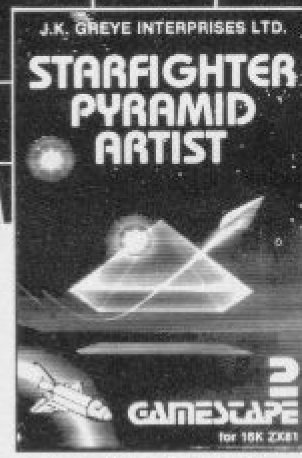
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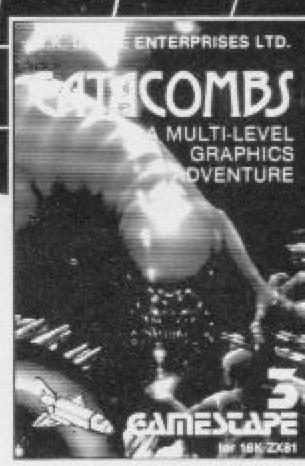
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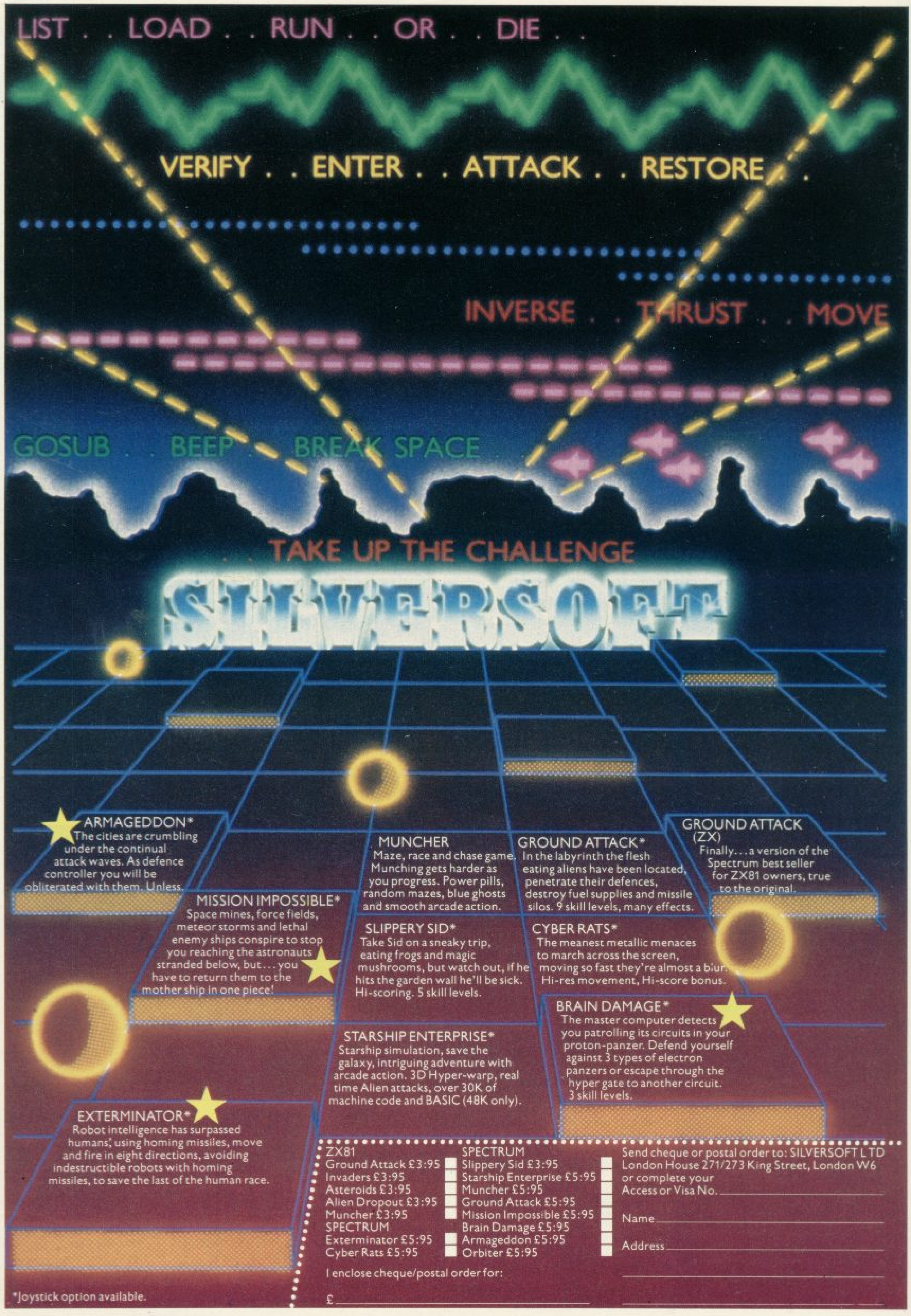
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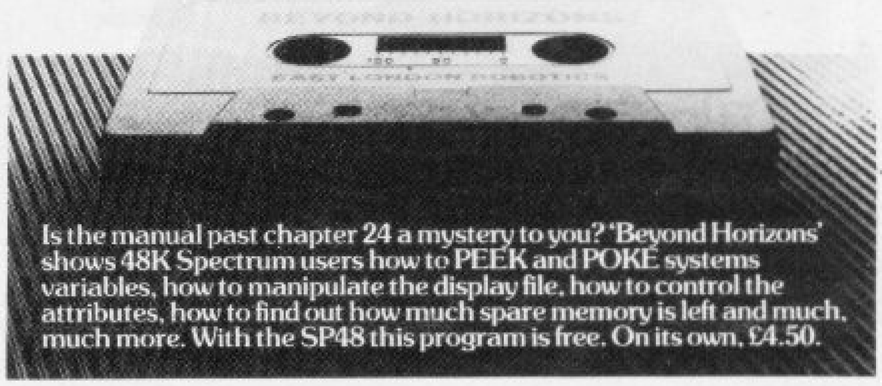
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EAST LONDON ROBOTICS

Backgammon has long been a popular game which requires a mixture of luck and skill. John Lambert reports on three versions

Ancient game has varied success on the Spectrum

BACKGAMMON IS AN ancient game involving much more skill than draughts, yet dependent more on luck than chess. It is as old, or possibly older than any of them. The ancient civilisations of China, India and Greece all offer possible birthplaces. There are three versions of the game for the Spectrum by Psion, 16K; Hewson Consultants, 16K; and C P Software, 48K; all priced at £5.95.

Each cassette has instructions for those new to the game. Those written for C P are good, clear and detailed. Backgammon is a complex game and the notes make play easy for a complete beginner. The Psion instructions are equally useful but those provided by Hewson are not nearly as well put together and might be confusing for the novice.

When playing Backgammon, the visual impact of the board and layout of the 'men' is vitally important — you need to be able to assess your position and your opponents at a glance, so the graphics are a prime consideration.

On loading, Hewson offers a choice of single game, points series, gambling series or a demonstration game. The latter is very helpful for the newcomer and compensates a little for the deficiency in written instructions. There is also a choice of static levels and you can choose who starts the game, although, strictly speaking, that is against the rules.

The board is swiftly presented but unfortunately it is not easy to see, either in colour or black and white. The 'men' do not stand out from the board and the computer moves are made much too quickly for the experienced player to follow, let alone the novice. A record of the moves appears on screen below the table. The Hewson graphics are simple and not very effective compared to the others.

Load the C P version and you are presented with brief instructions for play, which neither of the others provides on-screen, but there is no choice of skill level. The graphics are much better than those of Hewson, though the board is drawn very slowly, that part of the program being in Basic. The definition is good, making the men easily visible in colour, and only a little less so in black and white, but since the points are not coloured alternately as they should be it is often difficult to calculate your moves. In this program the chosen pieces flash before a move is made so that it is easy to follow and a record is kept below of the moves, but it is SLOW and your moves have to be entered singly, which can be frustrating when a double is thrown.

In its normal fashion, Psion presents a screen display for you to look at while the game is loading, even though the screen takes almost as long as the game to load. Incidentally that was a black mark for Psion: whoever drew its screen should have realised that opposite faces on a dice add to seven rather than adjacent ones. That criticism, however, should not detract from the spectacular nature of board display. You select from four skill levels, with a demonstration game available, and then are given the opportunity to input your own dice throws. It is the only one of the three which allows this, a feature which other games programmers would be wise to copy since your faith in the randomness of the RND generator will be shaken by the dice thrown in all the programs.

The board is drawn quickly with the points coloured alternately in black and white and the pieces, large enough to see easily, four character squares, in red and cyan. The definition is not lost when using a black and white television. The dice 'roll' in 3D up the screen and the pieces move across the board from point to point, making it simple to follow the course of the game. On the points with more than five men, the pieces appear to stand on their edges to make space, whereas the other two games resort to using numbers in that situation. When blots are hit, they travel gracefully to the bar, where a maximum of two men of any one player are shown at a time.

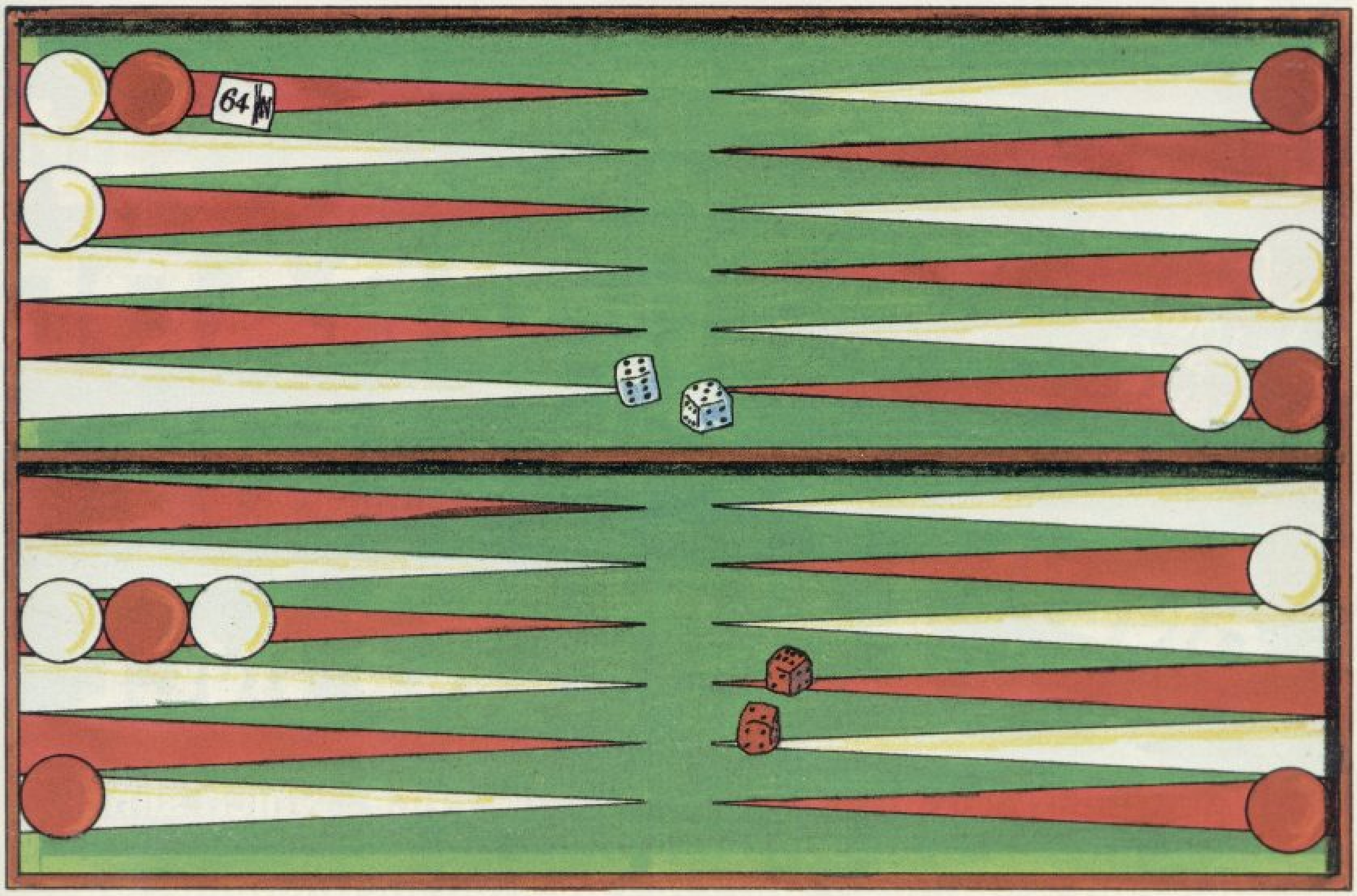
In the middle of the bar is the doubling cube, which moves from player to player in use. Hewson is the only other game to offer doubles but only in its gambling series.

> 'The CP graphics are much better than those of Hewson, though the board is drawn very slowly, that part being in Basic. The definition is good, making the men easily visible'

Moves can be changed after they have been made by use of the DELETE key, the men retracing their steps across the screen. EDIT elicits suggested moves to help the novice player throughout the game. The graphic display is well-designed and effective.

All the games use the conventional rules of play, as published by Hoyle, but for scoring C P has no doubling option, an integral part of the modern game. Hewson uses its own method of calculating points instead of the accepted one. Only Psion scores correctly.

Hewson plays erratically, sometimes being very conservative and at other times taking wild risks. Moreover, by moving about frequently within its own inner table it is unable to take full advantage of the dice. When playing a back game it does not persevere long enough and on one occasion when one of its men was on the bar and most of its opponent pieces had been borne off leaving a blot on the three, Hewson threw five/three and came in on the five, thus losing a gammon. Apart from that instance it usually 'hits' at almost every opportunity and so it can be trapped by a skilful opponent. On the whole the level of play, even at its



highest, is moderate and does not provide a stimulating challenge to an experienced player.

It is interesting to note that M Male, the author, also wrote the excellent air traffic control simulation, Heathrow, for Hewson.

C P is another fanatical taker, but rarely takes the conventional precaution of building houses in its inner table. On the rest of the board its moves are generally conservative but its defeats of Hewson, as indeed when Hewson beat it, depended on some very lucky dice throws towards the end of the game. The two programs are well matched, their skill levels being about the same and their strategies very similar.

Psion plays a much more sensible game and provides more of a challenge. It makes better and more frequent use of the standard openings and its strategy throughout the game is more consistent. It protects its inner table and leaves few unnecessary blots but once again when playing a back game it tends to lack conviction and runs for home too soon.

To test the abilities of the games a 'tournament' was arranged. Each program played five games against each of the others. The results, shown in the table, were surprisingly even.

It was expected, on the basis of playing the game individually, that the result to be would Psion first, Hewson and then C P. None of those programs, however, can assess the play of its opponent, which is why they fail to take advantage of each other's faults. Human players would assess and eventually predict their opponent's moves, frustrating a back game by refusing to hit blots, or avoiding blots left as obvious traps.

'Results depended often merely on the luck of the dice'

Since the programs cannot do that, the Psion game, for example, fails to realise that its opponents play consistently badly, and cannot capitalise on that as a human player does. For the same reasons, Hewson and C P opposed each other three times with identical strategies and neither was able to realise that and alter its play accordingly. The results therefore depended often merely on the luck of the dice.

The Psion game is programmed entirely in machine code and so uses the comparatively small space available on a 16K machine efficently, even using the spare space in the printer buffer for the table of the positions of the men on the boards. When the Microdrive becomes available it may be a problem to fit it in. On the other hand Hewson and CP are written, predominantly in Basic, Hewson about 70 percent and CP nearly 90 percent; that makes them somewhat cumbersome and would, particularly in the case of C P, welcome the use of a good compiler.

RESULTS

	1	2	3	4	5	
Psion v.		W	B	W		Psion wins 5/3
Hewson	G				W	
Hewson v.		W				CP wins 8/1
CP	G		G	W	W	
CP v.	G				G	Draw
Psion		W	W	G		

W = Win G = Gammon B = Backgammon

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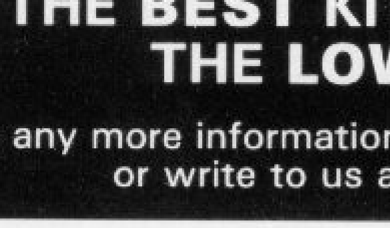
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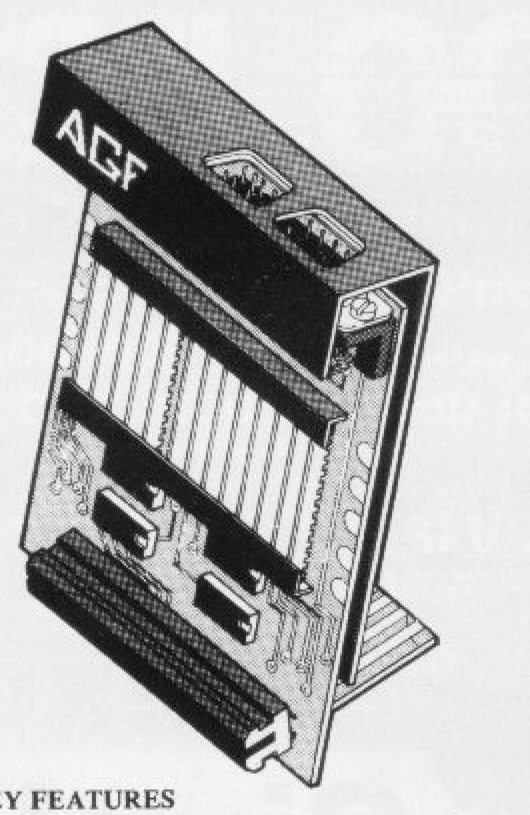
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KEY FEATURES

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- ★ Rear extension connector for all other add-ons.
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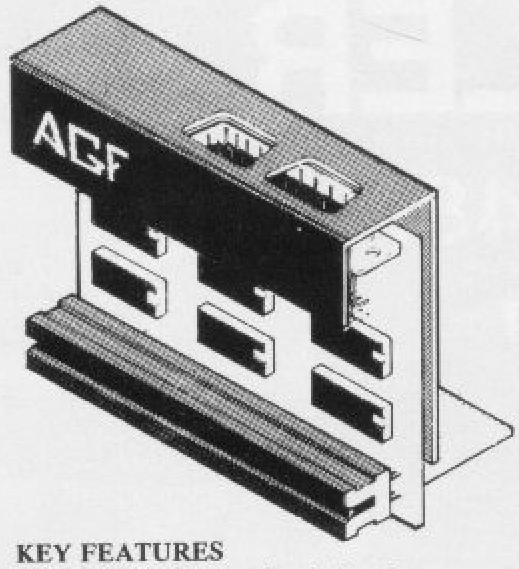
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When a suitable joystick is plugged into 'Player 1' socket its action will mimic pressing the cursor keys, up "7", left "5" and so on. The firing button will simulate key ϕ. This unique feature guarantees the best software support.

Take a look at the selection of compatible games we have listed. More are being added all the time as a result of our contact with the various software companies.

A second Joystick may be connected in the 'Player 2' position which simulates in a parallel fashion keys T-Y-U-I-P. This will allow you to play a whole new generation of two player games.

KEY FEATURES

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- ★ Second Joystick facility
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	SOFTWARE:		
	SOFTWARE:		
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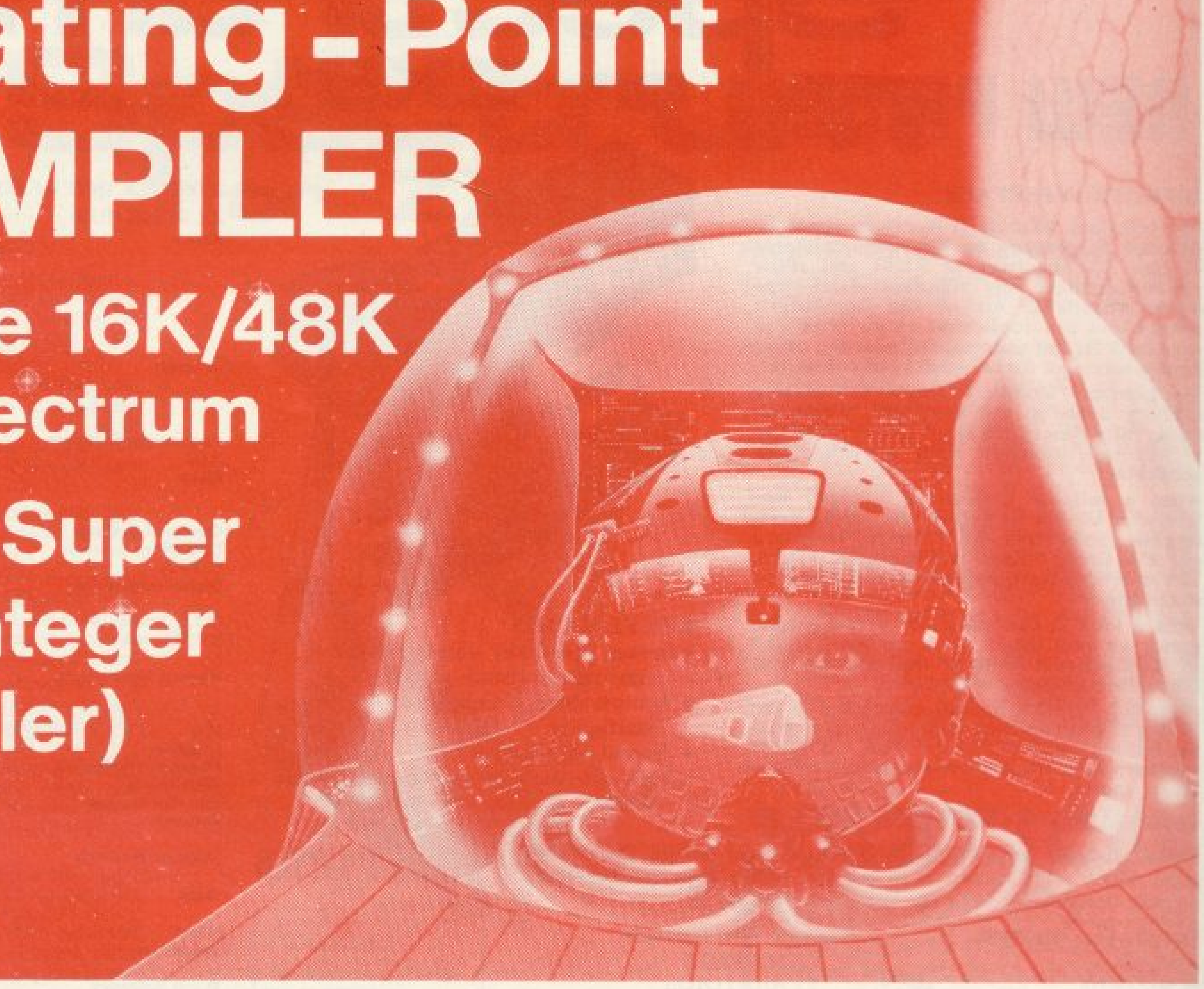
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All entries must be received by October 31.

The usual conditions about the editor's decision being final and employees of ECC Publications and associated companies being ineligible apply.

```
 10 REM PRINT CHR$ (211): PRINT
;
 20 NEXT M
 30 FOR K=1 TO 2
 40 NEXT K
 50 PRINT "WELL DONE"
 60 REM DIM A(39)
 70 LET C=CODE ("H"): LET D$=CH
R$ (C+12)
 80 PRINT "CODE-";
 90 DATA 29,108,692,23,49,76,85
,3,18,492,"",83,47,30,11,78,85,5
7,33,1,88,57,19,62,0,7,61,10,26,
21,26,26,26,7,18,61,31,14,2,61
 110 PRINT D$;
 120 FOR M=1 TO 20
 130 PRINT MICRODRIVE COMPETITIO
N
 140 PRINT A(CODE ("/"));
 150 FOR K=1 TO 39: READ A(K): L
ET A(K)=B: NEXT K
```

ENTRY FORM

The secret code is ....

....

Name ....

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SPECT

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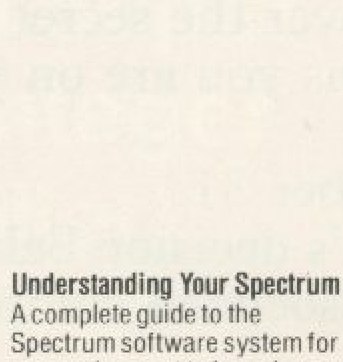
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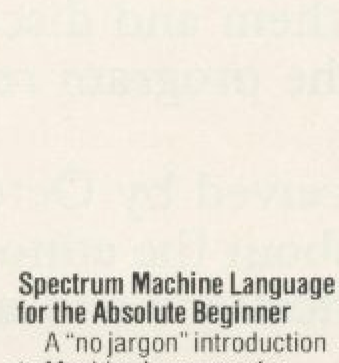
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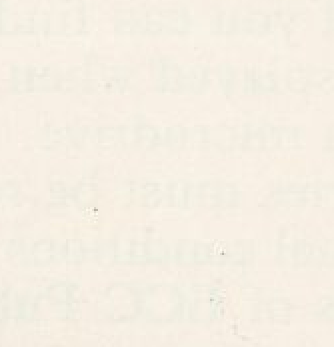
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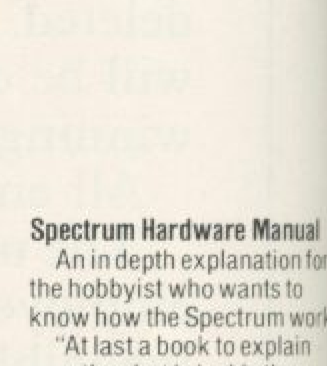
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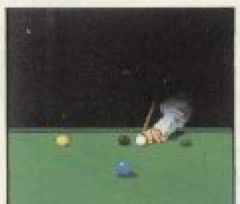
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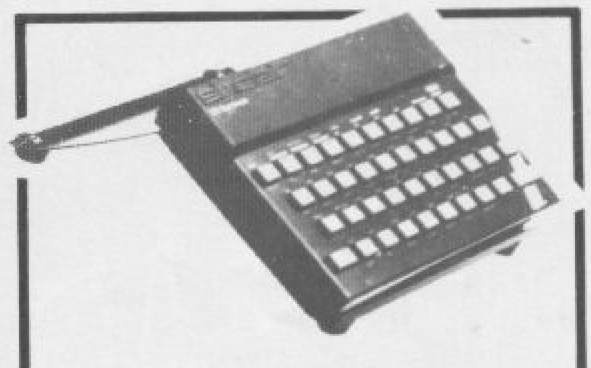
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*Allow 28 days for delivery.

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

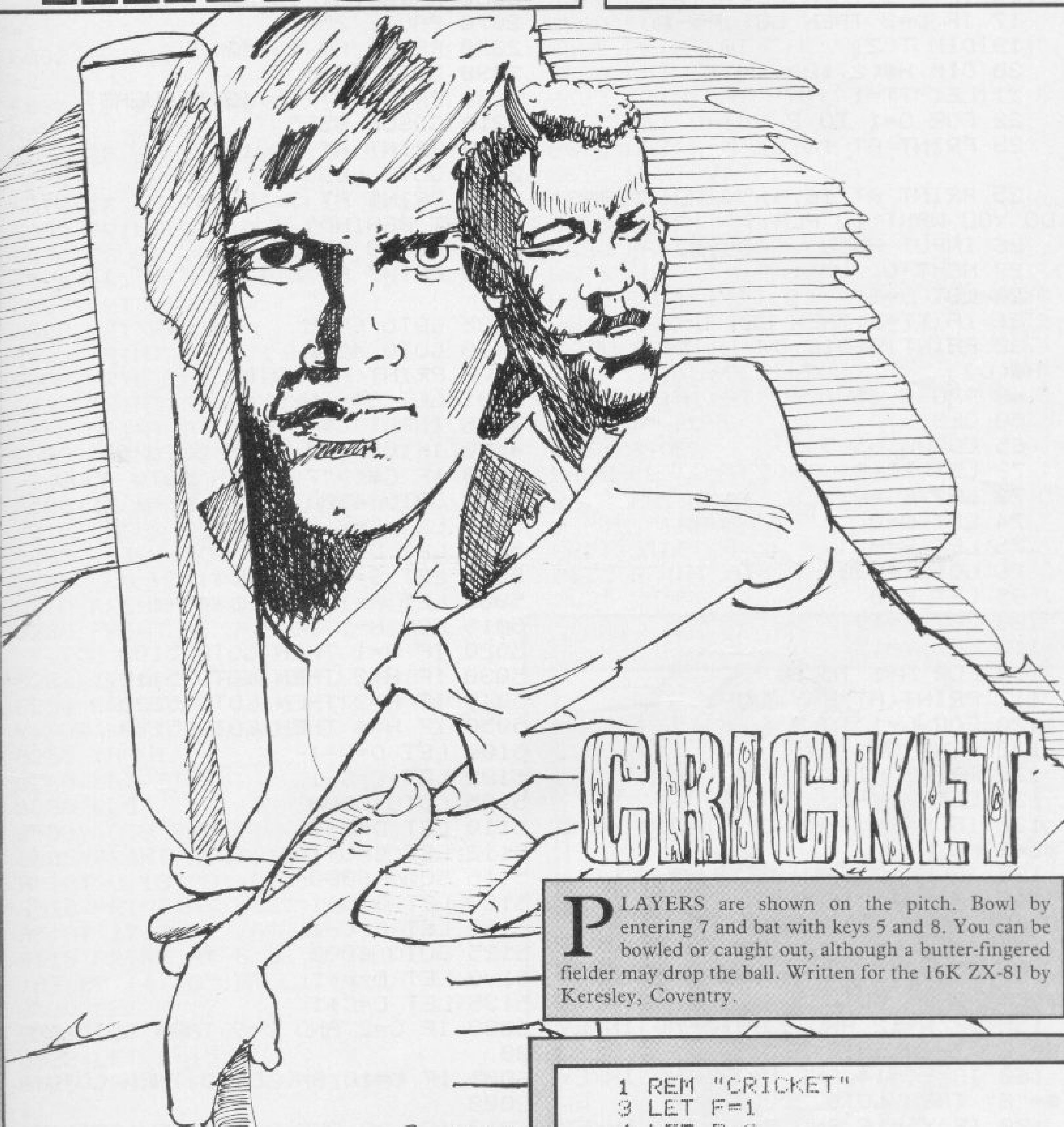
Signature __________
Date __________

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COMPUTER ADD-ONS
7-9 Thane Works, Thane Villas London N7

PROGRAM PRINTOUT

To help with entering graphics characters we have adopted a system of writing the characters for the ZX-81. We indicate inverse characters by the letter i and graphics by g, so that an inverse letter W is shown as iW and the graphics character on key 6 is denoted by g6. Spaces are shown by sp and inverse spaces are isp. If some occur together, for instance a row of six spaces , they are shown by *6sp and where there is a combination of characters each one is divided by a colon, thus sp:isp:6*g6 means a space followed by an inverse space and then six characters on the 6 key. Where whole words are written in inverse letters they appear in the listings as lower-case letters.
In the Spectrum listings, letters to be entered in graphics mode are underlined, while other graphics instructions are underlined and take the form shown above, with the addition that inverse graphics characters are represented by the letters "ig".



CRICKET

PLAYERS are shown on the pitch. Bowl by entering 7 and bat with keys 5 and 8. You can be bowled or caught out, although a butter-fingered fielder may drop the ball. Written for the 16K ZX-81 by Keresley, Coventry.

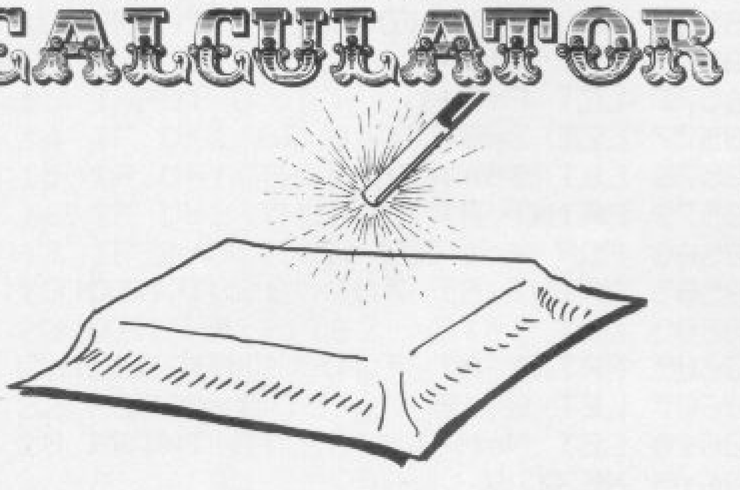
```
   1 REM "CRICKET"
   3 LET F=1
   4 LET Z=0
   5 PRINT AT 0,10;"CRICKET";AT
1,10;"(7*9s)"
   7 PRINT AT 4,0;"7...FOR NEXT
DELIVERY"
   8 PRINT AT 7,0;"5...TO STRIKE
```

```
 BALL ON OFF-SIDE"
   9 PRINT AT 10,0;"8...TO STRIK
E BALL ON ON-SIDE"
  12 PRINT AT 16,0;"LEVEL OF DIF
FICULTY? (1-3)"
  13 INPUT D
  14 IF D<1 OR D>3 THEN GOTO 12
  15 IF D=1 THEN LET P=3
  16 IF D=2 THEN LET P=1
  17 IF D=3 THEN LET P=-1
  19 DIM T(2)
  20 DIM H$(2,12)
  21 LET TT=1
  22 FOR O=1 TO 2
  23 PRINT AT 16,0;"
                 "
  25 PRINT AT 16,0;"WHICH TEAMS
DO YOU WANT TO PLAY?"
  26 INPUT H$(O)
  27 NEXT O
  28 LET O=1
  31 IF TT=2 THEN LET O=2
  32 PRINT AT 18,0;"INNINGS OF "
;H$(O)
  40 PAUSE 25
  50 CLS
  65 GOSUB 8505
  72 LET RR=0
  73 LET SS=0
  74 LET W=0
  75 LET R=0
  76 GOTO 4500
  95 LET K=0
 100 LET X=19
 110 LET Y=15
 115 FOR N=1 TO 20
 117 PRINT AT X,Y;"*"
 120 FOR G=1 TO P
 122 NEXT G
 125 PRINT AT X,Y;" "
 127 LET X=X-1
 130 IF N=10 THEN LET Q=INT (RND
*5-3)
 135 IF N=10 THEN LET Y=Y+Q
 140 IF N<>12 AND INKEY$="0" THE
N LET N=13
 145 IF X<=3 THEN LET X=3
 150 IF N=12 AND Y<=15 AND INKEY
$="5" THEN GOTO 5001
 155 IF N=12 AND Y>=16 AND INKEY
$="8" THEN GOTO 5001
 160 IF Y<=14 AND N=12 AND INKEY
$="8" THEN GOTO 3000
 170 IF Y>=16 AND N=12 AND INKEY
$="5" THEN GOTO 3000
1200 NEXT N
1210 IF Y=B THEN GOTO 1300
1220 IF Y=B+1 THEN GOTO 1300
1250 GOTO 4500
1300 PRINT AT 13,13;"BOWLED"
1303 GOSUB 8555
1305 PRINT AT 13,13;"      "
1308 GOTO 6095
2000 LET K=INT (RND*2)+1
2010 IF K=1 THEN GOTO 2200
2020 IF K=2 THEN GOTO 2050
2050 GOSUB 8555
2060 PRINT AT 13,13;"DROPPED"
2070 PAUSE 25
2080 PRINT AT 13,13;"       "
2090 GOTO 6095
2200 PRINT AT 13,13;"CAUGHT"
2210 GOSUB 8555
2220 PRINT AT 13,13;"      "
2250 GOTO 6095
3000 PRINT AT 3,15;"*";AT 13,0;"
CAUGHT BEHIND"
3010 GOSUB 8555
3020 PRINT AT 3,15;" ";AT 13,0;"
             "
3035 GOTO 6095
4410 GOTO 4500
4500 PRINT AT 10,B;"  "
4501 LET G$=INKEY$
4505 INPUT G$
4510 IF G$="7" THEN GOTO 85
4520 IF G$<>"7" THEN GOTO 4500
5000 GOTO 4500
5005 LET C=X
5006 LET D=Y
5007 LET S=INT (RND*15)
5008 LET H=INT (RND*4)+1
5015 FOR N=1 TO S
5020 IF H=1 THEN GOTO 5100
5030 IF H=2 THEN GOTO 5110
5040 IF H=3 THEN GOTO 5120
5050 IF H=4 THEN GOTO 5130
5100 LET D=D-1
5102 LET C=C-1
5105 GOTO 6000
5110 LET D=D-1
5112 LET C=C+1
5115 GOTO 6000
5120 LET D=D+1
5122 LET C=C-1
5125 GOTO 6000
5130 LET D=D+1
5135 LET C=C+1
6000 IF C=2 AND D=9 THEN GOTO 20
00
6005 IF C=10 AND D=10 THEN GOTO
2000
6010 IF C=0 AND D=20 THEN GOTO 2
000
6015 IF C=15 AND D=22 THEN GOTO
2000
6040 PRINT AT C,D;"*"
6045 FOR O=1 TO 3
```

```
6046 NEXT Q
6047 IF C<=0 THEN LET N=S
6048 IF C>=20 THEN LET N=S
6049 IF D<=0 THEN LET N=S
6050 PRINT AT C,D;" "
6055 GOSUB 8525
6060 NEXT N
6061 IF S>=0 AND S<=3 THEN LET R
=1
6062 IF S>=4 AND S<=7 THEN LET R
=2
6063 IF S>=8 AND S<=10 THEN LET
R=3
6064 IF S>=11 AND S<=13 THEN LET
 R=4
6078 IF S>=14 THEN LET R=6
6082 PRINT AT 10,B;R
6084 PAUSE 10
6086 LET T(O)=T(O)+R
6087 LET Z=Z+R
6088 LET RR=T(O)
6095 PRINT AT 0,1;H$(O)
6096 PRINT AT 1,2;T(O)
6097 PRINT AT 2,1;"FOR"
6098 PRINT AT 3,2;W
6099 PRINT AT 10,0;"NO.";F;AT 11
,3;Z
7000 IF W=10 THEN GOTO 8200
7010 GOSUB 8505
8000 GOTO 4500
8200 CLS
8210 PRINT AT 5,5;"ALL OUT"
8220 PRINT AT 7,5;H$(O);" SCORED
 ";T(O)
8222 IF O=2 THEN GOTO 8630
8250 PRINT AT 10,0;"PRESS ANY KE
Y FOR NEXT INNINGS"
8255 INPUT C
8260 LET TT=2
8300 CLS
8500 GOTO 28
8505 PRINT AT 1,15;"O";AT 2,15;"
A";AT 0,13;"O";AT 1,13;"A"
8510 PRINT AT 4,27;"O";AT 5,27;"
A";AT 17,7;"O";AT 18,7;"A"
8515 PRINT AT 5,5;"O";AT 6,5;"A"
;AT 20,14;"O";AT 21,14;"A"
8520 LET M=17
8521 LET A=5
8522 LET B=15
8525 PRINT AT A,B;"II";AT 21,B;"
II"
8530 PRINT AT 7,M;"O";AT 8,M;"?"
;AT 8,16;"/"
8535 PRINT AT 2,9;"O";AT 3,9;"A"
;AT 10,10;"O";AT 11,10;"A"
8540 PRINT AT 1,11;"O";AT 2,11;"
A"
8545 PRINT AT 0,20;"O";AT 1,20;"
A";AT 15,22;"O";AT 16,22;"A"
8550 RETURN
8569 IF K=2 THEN RETURN
8575 LET W=W+1
8576 LET F=F+1
8577 LET Z=0
8578 LET SS=T(O)
8579 PRINT AT 11,3;"    "
8580 FOR V=1 TO 17
8585 PRINT AT 7,M;"O";AT 8,M;"X"
8600 LET I=10
8605 PRINT AT 7,M;" ";AT 8,M;" "
8607 LET U=10
8610 LET M=M-1
8615 NEXT V
8620 RETURN
8625 STOP
8630 PAUSE 20
8635 CLS
8640 IF T(1)>T(2) THEN GOTO 8650
8642 IF T(1)=T(2) THEN GOTO 8672
8645 IF T(1)<T(2) THEN GOTO 8665
8650 LET U=T(1)-T(2)
8655 PRINT AT 10,0;H$(1);"WINS B
Y ";U;" RUNS"
8660 STOP
8665 LET U=T(2)-T(1)
8670 PRINT AT 10,0;H$(2);"WINS B
Y ";U;" RUNS"
8671 STOP
8672 PRINT AT 10,0;"MATCH DRAWN"
8675 STOP
```



MYSTERY CALCULATOR



WATCH YOUR 16K ZX-81 perform a party trick, courtesy of Carl Johanson of Park North, Swindon. Select any number between one and 63. The computer will then show you six cards with numbers on them. Press Y if your number is on a card, N if not. When you have seen and responded to all six cards the computer will tell you the number of which you thought originally.

```
   5 LET F=0
  10 DIM B(6)
  20 LET Y=1
  30 LET N=0
  40 PRINT ,,"???????mystery cal
culator???????"
  60 PRINT AT 8,0;"  YOU CHOOSE
A NUMBER BETWEEN      1 AND 63.",
,"  THEN A SERIES OF 6 CARDS WIL
L   BE SHOWN IN TURN,YOU ARE THE
N   REQUIRED TO TYPE EITHER YES
OR  NO (Y OR N) DEPENDING ON
    WHETHER YOUR NUMBER APPEARS
OR  NOT."
  70 PRINT ,,,,"I WILL THEN TELL
 YOU YOUR NUMBER"
  80 PRINT AT 20,0;"  Press any
key for first card  "
  90 IF INKEY$="" THEN GOTO 90
 100 CLS
 110 PRINT AT 0,0;"CARD:";1
 120 PRINT AT 7,0;"      1  3  5
 7  9 11 13 15      ",,"      17 19
 21 23 25 27 29 31      ",,"      3
3 35 37 39 41 43 45 47      ",,"
   49 51 53 55 57 59 61 63      "
 130 GOSUB 500
 140 PRINT AT 0,5;2;AT 7,0;"
 2  3  6  7 10 11 14 15      ",,"
   18 19 22 23 26 27 30 31
",,"      34 35 38 39 42 43 46 47
   ",,"      50 51 54 55 58 59 6
2 63      "
 150 GOSUB 550
 160 PRINT AT 0,5;3;AT 7,0;"
 4  5  6  7 12 13 14 15      ",,"
   20 21 22 23 28 29 30 31
",,"      36 37 38 39 44 45 46 47
   ",,"      52 53 54 55 60 61 62
 63      "
 170 GOSUB 550
 180 PRINT AT 0,5;4;AT 7,0;"
 8  9 10 11 12 13 14 15      ",,"
   24 25 26 27 28 29 30 31
",,"      40 41 42 43 44 45 46 47
   ",,"      56 57 58 59 60 61 62
 63      "
 190 GOSUB 550
 200 PRINT AT 0,5;5;AT 7,0;"
16 17 18 19 20 21 22 23      ",,"
   24 25 26 27 28 29 30 31
",,"      48 49 50 51 52 53 54 55
   ",,"      56 57 58 59 60 61 62
 63      "
 210 GOSUB 550
 220 PRINT AT 0,5;6;AT 7,0;"
32 33 34 35 36 37 38 39      ",,"
   40 41 42 43 44 45 46 47
",,"      48 49 50 51 52 53 54 55
   ",,"      56 57 58 59 60 61 62
 63      "
 230 GOSUB 550
 240 CLS
 250 FOR X=1 TO 6
 260 LET F=F+B(X)*2**(X)
 265 PRINT AT 12,0;"        NOW,LET
 ME THINK....."
 267 IF X=4 THEN PRINT AT 16,0;"
     AH,I KNOW NOW."
 270 NEXT X
 280 CLS
 290 PRINT AT 10,0;"     YOUR NUM
BER WAS ";F/2
 300 FOR C=1 TO 20
 310 NEXT C
 320 PRINT AT 21,0;" PRESS ANY K
EY FOR ANOTHER GO "
 330 IF INKEY$="" THEN GOTO 330
 340 CLS
 350 RUN
 500 FOR E=1 TO 6
 510 LET A$=INKEY$
 520 IF A$<>"N" AND A$<>"Y" THEN
 GOTO 510
 530 LET B(E)=VAL A$
 535 IF INKEY$<>"" THEN GOTO 535
 540 RETURN
 550 NEXT E
9998 SAVE "CALc"
9999 RUN
```



TURPIN

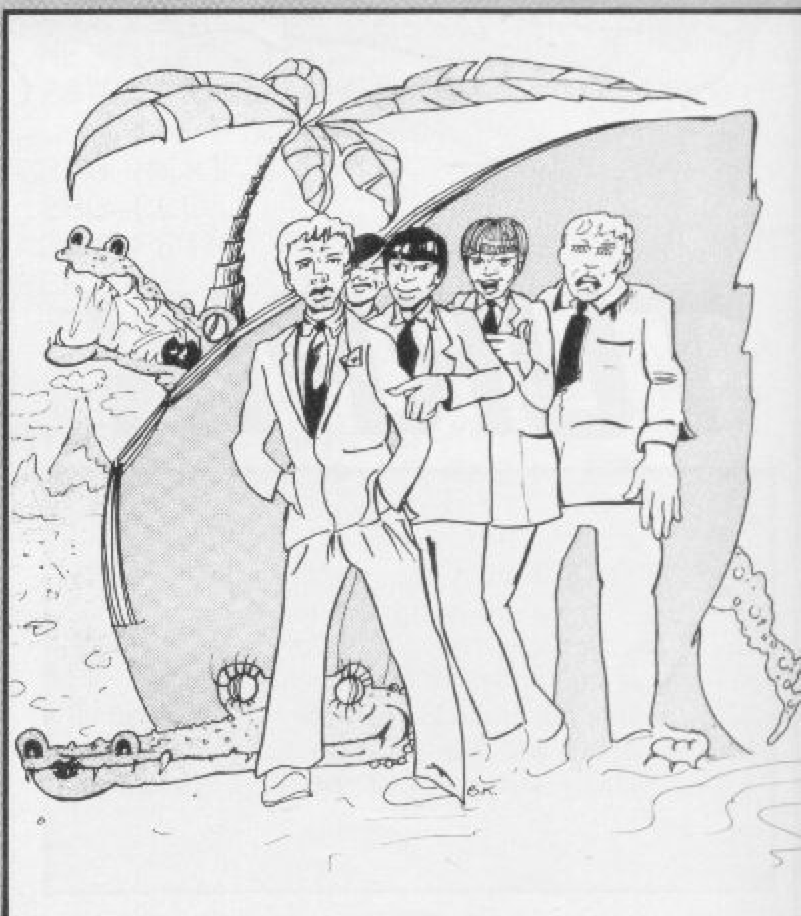
MOVE around the white streams on the screen by using the usual cursor keys. Collect a terrapin (inverse O) and take it to home at the top left of the screen. Can you avoid both the moving crocodile and the rogue terrapins, both of which will kill you? Written for the 16K ZX-81 by Angus Appleby of Arbroath, Angus.

```
 1 REM 0000000
 2 POKE 16514,42
 3 POKE 16515,14
 4 POKE 16516,64
 5 POKE 16517,78
 6 POKE 16518,6
 7 POKE 16519,0
 8 POKE 16520,201
20 LET S=0
25 CLS
30 PRINT "<32*isP>"
40 FOR N=1 TO 20
50 PRINT "<isP>";TAB 31;"<isP>
"
60 NEXT N
```

```
  70 FOR N=1 TO 20 STEP 2
  80 PRINT AT N,0;"(isP:sP:isP:s
P:isP:sP:isP:sP:isP:sP:isP:sP:is
P:sP:isP:sP:isP:sP:isP:sP:isP:sP
:isP:sP:isP:sP:isP:sP:isP:sP:isP
)"
  90 NEXT N
 100 PRINT "(32*isP)"
 110 PRINT "(32*isP)"
 120 PRINT AT 1,1;"(9h)"
 130 LET J=0
 140 LET C=0
 150 FOR N=1 TO 6
 160 PRINT AT INT (RND*19)+1,INT
 (RND*29)+1;"(io)"
 170 NEXT N
 180 LET A=10
 190 LET B=10
 200 LET D=19
 210 LET E=29
 220 LET P=1
 230 LET O=1
 235 PRINT AT 21,0;"scoreE";S
 240 PRINT AT A,B;"*";AT D,E;
 250 LET A$=CHR$ USR 16514
 252 IF A$="(isP)" THEN GOSUB 90
0
 255 PRINT AT D,E;"O"
 260 LET L=A
 270 LET K=B
 280 LET G=D
 290 LET H=E
 310 PRINT AT A,B;" ";AT D,E;A$
 320 LET A=A+(INKEY$="6")-(INKEY
$="7")
 330 LET B=B+(INKEY$="8")-(INKEY
$="5")
 340 PRINT AT A,B;
 350 IF USR 16514<>0 THEN GOSUB
500
 360 LET P=(1 AND D<A)-(1 AND D>
A)
 370 LET O=(1 AND E<B)-(1 AND E>
B)
 380 IF P<>0 AND O<>0 THEN LET O
=0
 390 LET D=D+P
 400 LET E=E+O
 410 IF A=D AND E=B THEN GOTO 70
0
 420 GOTO 240
 500 IF USR 16514=128 THEN GOSUB
 550
 510 IF USR 16514=180 THEN GOSUB
 600
 520 IF USR 16514=136 THEN GOSUB
 1000
 530 RETURN
 550 LET A=L
 560 LET B=K
 570 RETURN
 600 IF C=1 THEN RETURN
 610 IF RND>.7 THEN GOTO 700
 620 LET J=J+1
 630 LET C=1
 640 PRINT AT 1,1;"(9h)"
 650 RETURN
 700 PRINT AT A,B;"(i*)"
 705 FOR N=1 TO 25
 710 PRINT AT 10,13;"deAD"
 720 PRINT AT 10,13;"DEad"
 730 NEXT N
 740 PAUSE 4E4
 750 RUN
 900 LET D=G
 910 LET E=H
 920 LET A$=" "
 930 RETURN
1000 IF C=0 THEN RETURN

1010 LET C=0
1020 LET S=S+10
1030 IF J=4 THEN GOTO 1100
1040 LET A=A+1
1045 LET D=INT (RND*19)+1

1050 LET E=INT (RND*29)+1
1055 PRINT AT 1,1;"(9h)"
1060 GOTO 235
1100 PRINT AT 10,10;"BONUS 1000"
1105 PAUSE 4E4
1110 LET S=S+1000
1120 GOTO 25
9000 SAVE "TURPIn"
9010 RUN
```



42 CHARACTERS





HELPLINE in the July issue gave hints on how to write a routine which would print 42 characters to a line. Paul Martin of Stockport has put the ideas into practice in a program for the 16K Spectrum.

Enter the words to be printed in A$, call-up the subroutine with GOSUB 9500, and enter GOSUB 9900 before starting if you have merged the routine with a larger program.

```
  20 BORDER 0: PAPER 0: INK 7
  40 CLEAR 32569: POKE 23609,100
  60 LET a$="": LET b$="": GO SUB 9900
 200 PRINT AT 21,0;">This has thirty two characters."
 220 LET A$="This has forty two characters per line!!!!"
 240 GO SUB 9500
 260 LET a$="And also the subroutine prevents words overlapping!"
 280 PRINT ''a$: GO SUB 9500
 300 STOP
9500 REM 42 to a line
9520 POKE 23692,255: PRINT
9540 IF LEN A$>42 THEN GO SUB 9800
9560 IF LEN A$<42 THEN LET A$=A$+" ": GO TO 9560
9580 FOR A=1 TO 41
9600 PRINT AT 21,31; OVER 1;A$(A)
9620 FOR B=1 TO 6
9640 RANDOMIZE USR 32570
9660 NEXT B: NEXT A
9670 PRINT AT 21,31;a$(42): RANDOMIZE USR 32570
9680 IF B$="" THEN RETURN
9700 LET A$=B$: LET b$=""
9720 GO SUB 9520: RETURN
9800 REM a$>42
9820 IF LEN A$>86 THEN STOP
9840 IF A$(43)=" " THEN LET B$=A$(44 TO ): LET A$=A$( TO 43): RETURN
9860 FOR C=43 TO 30 STEP -1
9880 IF A$(C)=" " THEN LET B$=A$(C+1 TO ): LET A$=A$( TO C): RETURN
9890 NEXT C: STOP
9900 RESTORE : REM M/C SCROLL
9920 FOR A=32570 TO 32598
9940 READ B: POKE A,B: NEXT A
9960 RETURN
9980 DATA 33,191,80,14,8,175,229,17,31,0,237,82,126,25,23,6,32,126,23,119,43,16,250,225,36,13,32,233,201
```

LASER ATTACK



THE space invaders above you drop laser bars which you cannot pass. By blasting the ground beneath them you weaken their foundation and can then blast away the bottom of a bar. Once that has been done they can be destroyed if you stand beneath them and fire upwards. You will suffocate if a laser bar or the earth is directly above you. Move left with 1, right with 0, up with 2, and down with m. Blast left with 3, right with 8 and upwards with 9. Your aim is to survive for as long as possible, gaining points by shooting invaders and laser bars.

Written for the 16K Spectrum by Alexander McKehnie of Harpenden, Herts.

```
  30 PRINT AT 10,10;"LAZER BARS"
  31 PAUSE 20: CLS : PRINT AT 1,
1;"THE AIM OF THIS GAME IS TO SH
OOT AS MANY INVADERS AS POSSIBLE
. UNFORTUNATELY,TO DO SO YOU MUS
T BURROW UNDER LAZERS WHICH THE
INVADERS DROP."
  32 PRINT " IF YOU ARE LOW ENOU
GH YOU CAN GAIN EXTRA POINTS BY
SHOOTING A LASER."
  33 PRINT " YOU HAVE GOT THREE
LIVES. PRESS ANY KEY": PAUSE 0:
BEEP .1,40
  34 CLS : PRINT "YOU WILL HEAR
THIS NOISE WHEN YOU ARE LOSING A
 LIFE - Press a key": PAUSE 0: B
EEP .1,10: BEEP .1,20: BEEP .1,-
10
  35 CLS
  40 PRINT TAB (10);"CONTROLS"
  50  PRINT AT 1,1;"1 - to move
left";AT 3,1;"0 - to move right"
;AT 5,1;"9 - to fire "
  60 PRINT AT 7,1;"2 - to drop d
own";AT 9,1;"m - to jump up"
  70 PRINT AT 11,1;"3 - to blast
 left";AT 13,1;"8 - to blast rig
ht"
  80 PRINT AT 15,2;"If you are s
itting directly beneath somethin
g, such as land, or a laser,you
lose your lives."
  90 PRINT AT 19,0;"To gain a ho
le beneath you,you must kill an
invader above you"
  95 PRINT AT 20,29;".Itwill bec
ome clearer as you play."
  99 PRINT AT 2,18; INK 1; PAPER
 2;"Press any key": PAUSE 0
 100 REM GRAPHICS
 110 REM *GRAPHIC B FOR INVADER
 120 FOR a=0 TO 7

 130 READ x
 131 POKE USR "B"+a,x
 135 NEXT a
 140 DATA 126,90,60,126,90,66,66
,129
 141 REM *GRAPHIC D FOR LASER BA
SE
 142 FOR a=0 TO 7
 143 READ x
 144 POKE USR "D"+a,x
 145 NEXT a
 146 DATA 36,66,153,153,90,126,1
89,255
 150 REM *GRAPHIC C FOR LASER
 160 FOR a=0 TO 7
 170 POKE USR "C"+a,BIN 00011000
 180 NEXT a
 260 REM *GRAPHIC E FOR FIRE
 270 FOR a=0 TO 7
 280 POKE USR "E"+a,BIN 00010100
 290 NEXT a

 300 REM VARIABLES
 310 LET j=0: LET l=10: LET m=18
 LET life=3
 320 LET life=3: LET s=0: LET k=
0
```

```
330 PAPER 5: CLS : INK 0: CLS :
BORDER 1: CLS
340 PRINT AT 19,0; INK 4; PAPER
6;"(96*isP)"
350 PRINT AT 1,0; INK 7;"(8*isP
:21*sP:14*isP:6*sP:3*isP:11*sP:1
0*isP:7*sP:6*isP:13*sP:6*isP:6*s
P:5*isP:10*sP:10*isP:9*sP:4*isP:
7*sP:2*isP)"
360 REM INVADERS
370 FOR a=0 TO 31 STEP 2
380 PRINT AT 7,a;"B"
390 NEXT a
400 REM MOVE BASE
410 PRINT AT m,l;"D"
420 IF INKEY$="1" THEN LET l=l-
1
425 IF l<0 THEN LET l=0
430 IF INKEY$="0" THEN LET l=l+
1
435 PRINT AT 0,0; PAPER 0; INK
7; BRIGHT 1;"SCORE= "
440 IF INKEY$="9" THEN GO SUB 5
00
450 IF INKEY$="2" THEN GO SUB 6
00
451 IF s>15 THEN LET j=j+1: LET
s=0: PRINT AT 0,7;"   ": GO TO
360
455 IF ATTR (m-1,l)=106 THEN GO
SUB 900
460 IF INKEY$="m" THEN GO SUB 7
00
461 IF INKEY$="M" THEN GO SUB 7
00
462 IF INKEY$="3" THEN PRINT AT
m,l-1;" ": BEEP .01,0: BEEP .01
,-10
463 IF INKEY$="8" THEN PRINT AT
m,l+1;" ": BEEP .01,0: BEEP .01
,-10
465 IF ATTR (m-1,l)=52 THEN GO
SUB 900
470  IF INT (RND*50)=5 THEN GO
SUB 800
479 IF l>=31 THEN LET l=31
480 PRINT AT m,l;"D"
485 PRINT AT m,l; PAPER 5;" "
490 GO TO 420
500 REM FIRE
505 IF ATTR (m-1,l)=106 THEN RE
TURN
510 FOR u=m TO 6 STEP -1
520 PRINT AT u,l;"E"
530 IF SCREEN$ (u-1,l)<>" " THE
N LET s=s+1: BEEP .005,4: BEEP .
02,-2: PRINT AT 0,7;(16*j)+s: IF
m<21 THEN PRINT AT m+1,l;" "
540 PRINT AT m,l;"D"
550 PRINT AT u,l; OVER 1;"E"
560 NEXT u
570 RETURN
600 REM DROP
605 IF ATTR (m+1,l)=52 THEN RET
URN
610 PRINT AT m,l;" "
620 IF m<21 THEN LET m=m+1
630 PRINT AT m,l;"D"
640 IF SCREEN$ (m-1,l)<>" " THE
N GO SUB 700
645 RETURN
690 REM MOVE UP
700 IF ATTR (m-1,l)=52 THEN RET
URN
705 IF m<=10 THEN RETURN
710 PRINT AT m,l;" "
720 LET m=m-1
730 PRINT AT m,l;"D"
740 BEEP .02,-10
750 RETURN
790 REM LAZERS
801 RANDOMIZE
805 LET t=INT (RND*31)
808 FOR o=8 TO m
809 BEEP .005,m: BEEP .005,0
810 PRINT AT o,t; BRIGHT 1; INK
2;"C"
815 LET t=t
820 NEXT o
830 RETURN
900 REM LIVES
910 BEEP .1,10: BEEP .1,20: BEE
P .1,-10
920 LET life=life-1
930 PRINT AT 0,10; INK 0; PAPER
7; BRIGHT 1;"LIVES= ";life
940 IF life=0 THEN GO TO 1000
950 RETURN
1000 FOR a=1 TO 10: BEEP .01,a:
BORDER RND*7: BORDER RND*7: NEXT
a: BEEP 1,0: BEEP .1,-1: BEEP .
1,-2: BEEP 1,-10
1010 PRINT AT m,l; INK 2; FLASH
1;"D"
1015 PRINT AT 9,2;"YOUR SCORE: "
;(j*16)+s
1020 PRINT AT 1,1;"PRESS ANY KEY
": PAUSE 0
1030 INPUT "DO YOU WANT TO PLAY
AGAIN? (y/n)";x$
1040 IF x$="" THEN GO TO 1100
1050 IF x$( TO 1)="y" THEN GO TO
300
1100 CLS : PRINT AT 10,10;"THANK
YOU ";AT 11,13;"FOR";AT 12,10;"P
LAYING": BEEP .5,1: STOP
1200 SAVE "lazer" LINE 1: RUN
```

SKI SLOPE



YOUR skier moves steadily down the screen, moving left when 5 is pressed and right when 8 is pressed. Trees are represented by T, and hitting them means instant death. Posts are represented by 1 and bushes by graphic A. Hitting a post or a bush means the loss of five points. You gain one point for each move and the maximum number of points to be scored between Start and Finish is 56.

Ski Slope was written by R Wooberry for the 1K ZX-81.

```
1 LET D=VAL "7"
2 LET S=VAL "0"
3 LET R=VAL "0"
4 PRINT AT VAL "3",VAL "6";"S
TART"
5 PAUSE 100
6 LET D=D+(INKEY$="8")-(INKEY
$="5")
7 PRINT AT 4,D;
8 LET S=S+VAL "1"
9 LET C=VAL "PEEK (PEEK 16398
+256*PEEK 16399)"
11 IF C=VAL "8" OR C=VAL "29"
THEN LET S=S-VAL "5"
12 IF C=VAL "57" THEN GOTO VAL
"20"
13 PRINT "(isP)";AT 11,0;"T";A
T 11,15;"T";AT 11,RND*13+1;"1";A
T 11,RND*13+1;"(ga)";AT 11,RND*1
2+1;"TT";AT 11,RND*12+1;"TT"
14 LET R=R+VAL "1"
15 IF R=VAL "50" THEN PRINT AT
11,5;"FINISH"
16 IF R=VAL "56" THEN GOTO VAL
"21"
17 SCROLL
18 GOTO VAL "6"
20 PRINT "CRASH"
21 PRINT S
```

ATTR



YOU appear at the left of the screen, able to move up and down. Aliens appear on the right of the screen to be shot down by pressing '8'.

David Hookham of Barwell, Leicestershire has cleverly altered the x co-ordinate in lines 100 and 110 by four each time, thus allowing extremely fast movement. (16K ZX-81)

```
  40 GO SUB 9000: LET hi=0
  50 GO SUB 8000: GO SUB 7000
  60 FOR w=28 TO d STEP -1
  70 PRINT AT s,w; INK 4;"B "
  80 PRINT AT p,5; INK 6;"A"
  90 LET x=0
 100 IF INKEY$="7" THEN LET x=-4
 110 IF INKEY$="6" THEN LET x=4
 120 IF INKEY$="8" AND p=s THEN GO TO 1000
 130 IF p+x<=3 THEN LET x=0
 140 PRINT AT p,5;" "
 150 LET p=p+x: IF p>16 THEN LET p=16
 160 NEXT w
 170 LET lives=lives+1
 180 IF lives=5 THEN GO TO 2000
 190 LET s=INT (RND*4)*4+4
 200 IF s>=16 THEN LET s=4
 210 GO TO 60
1000 PRINT AT s,w;"  "
1010 LET sc=sc+10
1020 IF sc>10 THEN LET g=g+2
1030 GO TO 190
2000 PRINT AT 3,2;"SCORE = ";sc
2010 IF hi<sc THEN LET hi=sc
```

ACK

```
2020 PRINT AT 5,2;"HIGH = ";hi
2030 INPUT "Press ENTER to play
again "; LINE z$

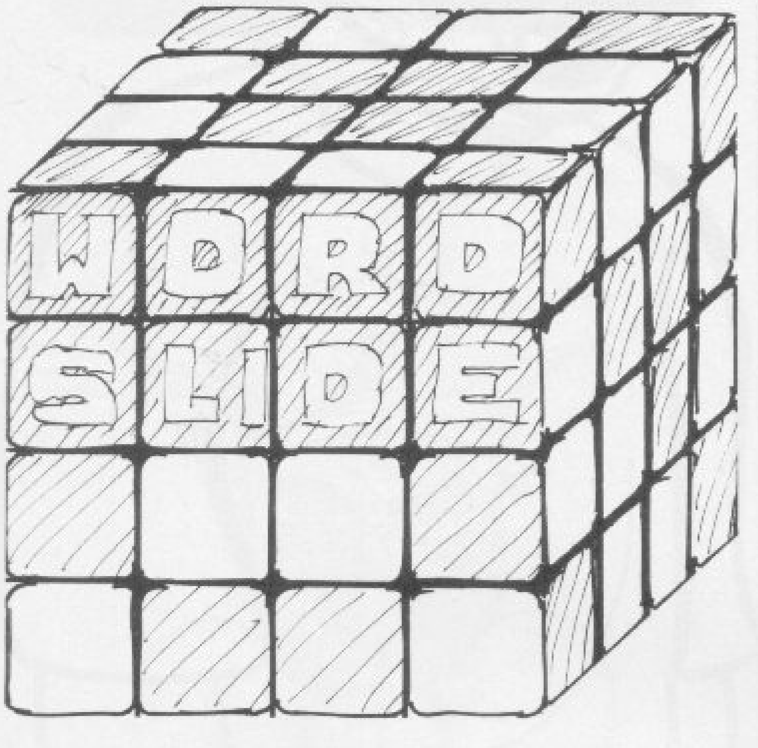
2040 GO TO 50
7000 BORDER 1: PAPER 1: INK 9: B
RIGHT 1: CLS
7010 PRINT AT 1,13;"Attack": PLO
T 100,159: DRAW 52,0
7020 PRINT AT 4,3;"This is the g
ame of ATTACK. "''" You must st
op the aliens from"''" invading

 your aerospace. You"''" move u
p and down with the ~7~"''" and
 ~6~ keys. You fire with"''" th
e ~8~ key. You have 5 lives"''"

 and the aliens will not "''" g
ive up!"
7030 PRINT AT 18,16;"You > A ";A
T 20,16;"Him > B ": PRINT AT 21,
3;"GOOD LUCK!"
7040 PRINT £1;"   Press any key
to continue"
7050 PAUSE 0
7060 BORDER 0: PAPER 0: INK 7: C
LS : RETURN
8000 LET sc=0: LET p=4: LET d=1
8010 LET lives=0: LET s=4: LET g
=1
8020 RETURN
9000 FOR a=1 TO 2: READ a$
9010 FOR n=0 TO 7: READ b
9020 POKE USR a$+n,b: NEXT n
9030 NEXT a: RETURN
9040 DATA "A",192,176,76,35,35,7
6,176,192
9050 DATA "B",60,90,126,60,24,36
,90,0
```



WORD SLIDE



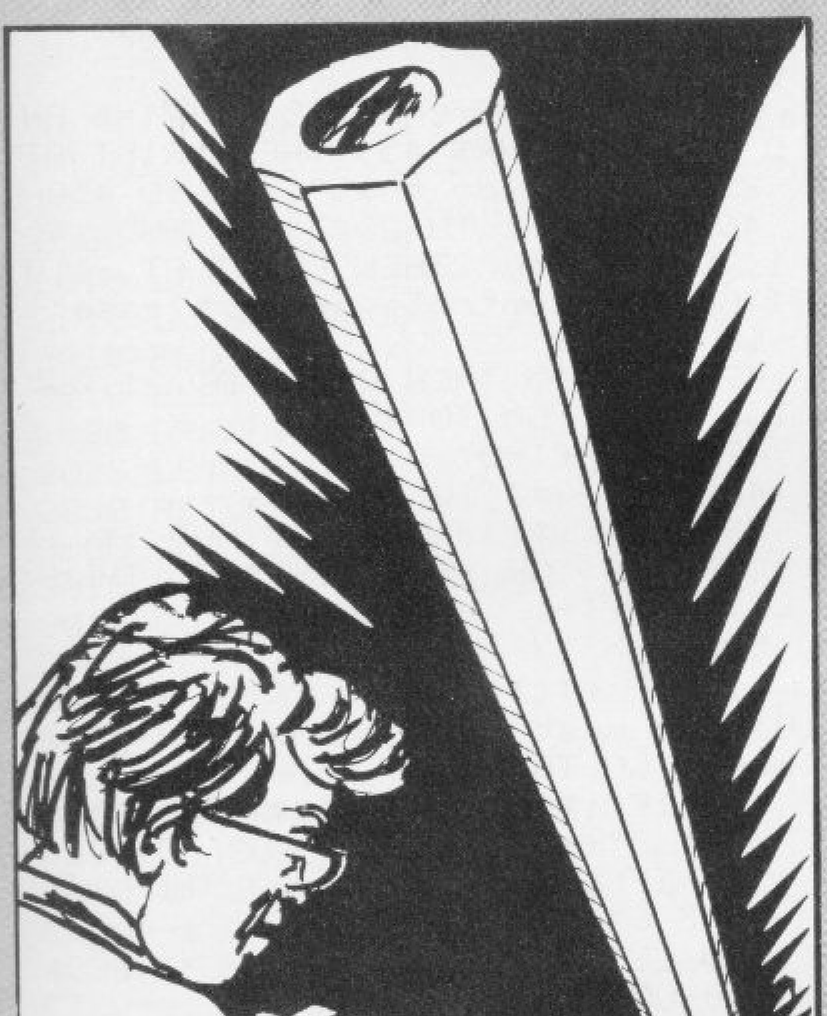
FIFTEEN letters appear in a four-by-four box. By sliding one of the letters adjoining the empty space into the space and repeating the process, try to arrange the letters into alphabetical order. To move a letter press the corresponding key.

Word Slide was written by Timothy Skinner of Hoveton, Norfolk for the 16K ZX-81.

```
  10 DIM A$(4,4)
  20 LET A$(1)="ABCD"
  30 LET A$(2)="EFGH"
  40 LET A$(3)="IJKL"
  45 LET A$(4)="MNO "
  46 GOSUB 600
  61 PRINT AT 0,0;,"(93·4*96·94)
"
  62 FOR N=1 TO 4
  63 PRINT ,"(98)";A$(N);"(95)"
  64 NEXT N
  65 PRINT ,"(92·4*97·91)"
  70 PRINT "INPUT LETTER"
  80 INPUT B$
  90 FOR N=1 TO 4
 100 FOR M=1 TO 4
 110 IF A$(N,M)=B$ THEN GOTO 150
 120 NEXT M
 130 NEXT N
 140 GOTO 80
 150 IF (N=X OR N=X+1 OR N=X-1)
AND (M=Y OR M=Y+1 OR M=Y-1) THEN
 GOTO 170
 160 GOTO 80
 170 LET A$(X,Y)=A$(N,M)
 180 LET A$(N,M)=" "
 190 LET X=N
 195 LET Y=M
 200 GOTO 61
 600 FAST
 610 FOR N=1 TO 20
 620 LET Q=INT (RND*4)+1
 630 LET T=INT (RND*4)+1
 631 LET P=INT (RND*4)+1
 632 LET L=INT (RND*4)+1
 640 LET T$=A$(Q,T)
 645 LET A$(Q,T)=A$(P,L)
 650 LET A$(P,L)=T$
 660 NEXT N
 661 FOR N=1 TO 4
 662 FOR M=1 TO 4
 663 IF A$(N,M)=" " THEN GOTO 67
1
 664 NEXT M
 665 NEXT N
 671 LET X=N
 672 LET Y=M
 673 SLOW
 680 RETURN
 700 SAVE "PUZZLe"
 710 RUN
```

COMLOGS

DAVID BYE of Saffron Waldon, Essex has written a version of the language LOGO for the 48K Spectrum. Commands should be entered as two letters and then a positive or negative number. In the instructions given the number is represented by an "n" in brackets.



Drawing commands:

rl (n) draws right to left

rl (-n) draws left to right

ud (n) draws vertically up

ud (-n) draws vertically down

du (n) draws diagonally up and right

du (-n) draws diagonally up and left

dd (n) draws diagonally down and right

dd (-n) draws diagonally down and left

Cursor commands:

ca (n) moves cursor right

ca (-n) moves cursor left

cu (n) moves cursor up

cu (-n) moves cursor down

Utility commands:

st stops the program or a repeat

hm homes the cursor

cs clears the screen, retaining the stream

rs re-sets

rp enables repeat

ru erases last command

```
   5 LET ff=0: LET m=0
   6 BORDER 5
  10 LET x=128: LET y=88
  12 LET g$=""
  15 LET w=0: LET v=0
  20 DIM a$(6,2): DIM d$(6,2)
  40 FOR j=1 TO 6
  50 READ a$(j)
  60 LET d$(j)=a$(j)
  70 LET a$(j)=" "+STR$ j
  80 NEXT j
  90 DATA "ud","rl","dd","du","c
a","cu"
 120 PRINT AT 8,12;"COMLOGS"
 125 PRINT AT 21,0;"Press any ke
y to start"
 130 IF INKEY$="" THEN GO TO 130
 135 CLS
 140 PLOT x,y
 142 INPUT "Command ",i$
 145 PRINT AT 21,0;"
                              "
 146 PRINT AT 21,0;i$
 147 LET fg=0
 150 IF i$="rs" THEN CLS : LET x
=128: LET y=88: LET g$="": GO TO
 140
 152 IF i$="cs" THEN CLS : GO TO
 140
 153 IF i$="st" THEN STOP
 154 IF i$="ru" AND LEN g$<10 TH
EN PRINT AT 21,0;"Cant rub out n
ow": GO TO 140
 155 IF i$="ru" THEN LET g$=g$(
TO (LEN g$-8))+"  ": LET fg=1: L
ET fh=1: LET fj=1: CLS : GO TO 2
00
 157 LET fj=0
 160 IF i$="rp" THEN LET fg=1: L
ET fh=6: GO TO 200
 165 IF i$="hm" THEN LET x=128:
LET y=88: GO TO 140
 170 GO SUB 999
 180 GO TO 140
 200 LET l=LEN g$
 210 IF l<5 THEN PRINT AT 21,0;"
That wont work": GO TO 140
 215 IF fh=0 THEN GO TO 440
 220 DIM x$(l,4)
 230 FOR j=1 TO l
 240 IF g$(j)=" " THEN GO TO 280
 245 IF x$(j-1)=" " AND x$(j+1)=
" " THEN GO TO 280
 250 IF g$(j-1)=" " THEN LET x$(
j)=g$(j TO (j+3))
 280 NEXT j
 290 FOR j=1 TO l
 300 IF x$(j,1)=" " THEN GO TO 3
70
 310 IF x$(j,1)="1" THEN GO SUB
2000
 320 IF x$(j,1)="2" THEN GO SUB
3000
 330 IF x$(j,1)="3" THEN GO SUB
4000
 340 IF x$(j,1)="4" THEN GO SUB
5000
 350 IF x$(j,1)="5" THEN GO SUB
6000
 360 IF x$(j,1)="6" THEN GO SUB
7000
 370 NEXT j
 380 IF fj=1 THEN GO TO 140
 440 PRINT AT 21,0;"Use ca or cu
 to move cursor      "
 444 IF ff=1 THEN LET g$=" "+g$(
m TO )
 445 LET ff=1: LET fh=1
 450 INPUT "Command",i$
 455 IF i$="st" THEN GO TO 950
 457 LET m=LEN i$+1
 460 PRINT AT 21,0;"
                              "
 461 LET l=LEN i$
 462 IF l<3 THEN PRINT AT 21,0;"
Must have command and number
": GO TO 450
 463 IF i$(l)=CHR$ 45 OR (l=5 AN
D i$(l-1)=CHR$ 45) THEN PRINT AT
 21,0;"Cant do that": GO TO 450
 465 IF i$(1 TO 2)<>"ca" AND i$(
1 TO 2)<>"cu" THEN PRINT AT 21,0
;"Cursor controls only, please":
 GO TO 450
 470 IF l>5 THEN PRINT AT 21,0;"
Too big": GO TO 450
 475 LET fl=0
 480 FOR j=3 TO l
 490 IF (i$(j)>CHR$ 47 AND i$(j)
<CHR$ 58) OR i$(j)=CHR$ 45 THEN
LET fl=fl+1
 500 NEXT j
 510 IF fl<l-2 THEN PRINT AT 21,
0;"You must give command and num
ber": GO TO 450
 520 IF i$(1 TO 2)="ca" THEN LET
 h$=" 5"+i$(3 TO )
 530 IF i$(1 TO 2)="cu" THEN LET
 h$=" 6"+i$(3 TO )
 540 LET g$=h$+"  "+g$
 550 GO TO 200
 950 PRINT AT 21,0;"Press C to g
o on,or F to finish "
 952 IF INKEY$<>"c" AND INKEY$<>
"f" THEN GO TO 952
 960 IF INKEY$="f" THEN STOP
 962 IF ff=1 THEN LET g$="   "+g$
(6 TO )
 965 LET ff=0
```

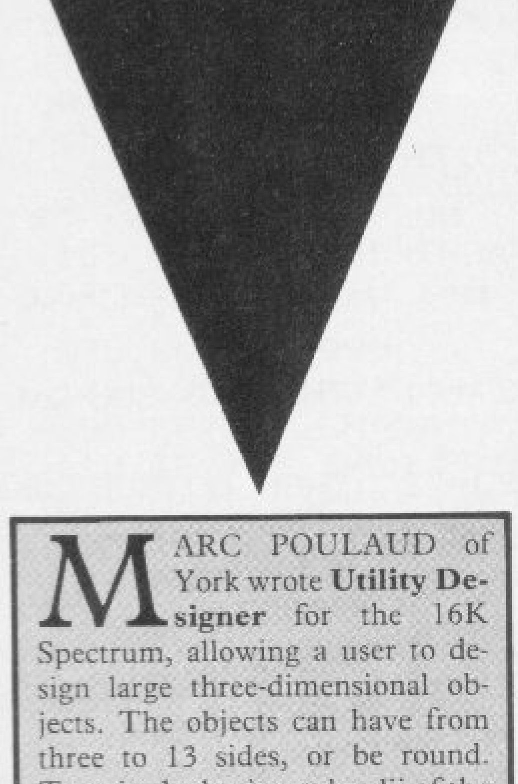
Continued over

Continued from page 76

```
 970 GO TO 140
 999 LET l=LEN l$: LET fl=0
1000 IF l<3 THEN PRINT AT 21,0;"
Must have command and number": R
ETURN
1001 IF l>5 THEN PRINT AT 21,0;"
Too big": RETURN
1002 FOR j=3 TO l
1003 IF (l$(j)> CHR$ 47 AND l$(j
)<CHR$ 58) OR l$(j)=CHR$ 45 THEN
 LET fl=fl+1: NEXT j
1004 IF fl<LEN l$-2 THEN PRINT A
T 21,0;"Must have command and nu
mber": RETURN
1005 LET e$=l$(1 TO 2): LET fl=0
1007 IF l$(l)=CHR$ 45 OR (l=5 AN
D l$(l-1)=CHR$ 45) THEN PRINT AT
 21,0;"Cant do that": RETURN
1010 FOR j=1 TO 6
1020 IF e$=d$(j) THEN LET e$=a$(
j): LET fl=1
1040 NEXT j
1050 IF fl=0 THEN PRINT AT 21,0;
"No such command": RETURN
1055 GO SUB 9500
1060 IF l=3 THEN LET g$=g$+e$+l$
(3 TO )+"    "
1065 IF l=4 THEN LET g$=g$+e$+l$
(3 TO )+"   "
1070 IF l>4 THEN LET g$=g$+e$+l$
(3 TO )+"  "
1080 RETURN
2000 GO SUB 8000
2010 LET w=e: LET v=0
2012 GO SUB 9000
2015 PLOT x,y
2017 BEEP .4,22
2020 DRAW v,w
2025 LET y=y+w
2030 RETURN
3000 GO SUB 8000
3010 LET v=e: LET w=0
3012 GO SUB 9000
3015 PLOT x,y
3017 BEEP .4,20
3020 DRAW v,w
3025 LET x=x+v
3030 RETURN
4000 GO SUB 8000
4020 IF  SGN e=1 THEN LET v=e: L
ET w=-e
4030 IF SGN e=-1 THEN LET w=e: L
ET v=e
4032 GO SUB 9000
4035 PLOT x,y
4037 BEEP .4,19
4040 DRAW v,w
4045 LET x=x+v: LET y=y+w
4050 RETURN
5000 GO SUB 8000
5020 IF SGN e=1 THEN LET v=e: LE
T w=e
5030 IF SGN e=-1 THEN LET w=-e:
LET v=e
5032 GO SUB 9000
5035 PLOT x,y
5037 BEEP .4,21
5040 DRAW v,w
5045 LET x=x+v: LET y=y+w
5050 RETURN
6000 GO SUB 8000
6010 LET x=x+e
6012 IF x<0 THEN LET x=0
6013 IF x>255 THEN LET x=255
6015 PLOT x,y
6020 RETURN
7000 GO SUB 8000
7010 LET y=y+e
7012 IF y<0 THEN LET y=0
7014 IF y>175 THEN LET y=175
7015 PLOT x,y
7020 RETURN
8000 IF f9=0 THEN LET e=VAL l$(3
 TO ): RETURN
8005 IF x$(j,3)<>" " THEN LET e=
VAL x$(j)(2 TO 3)
8010 IF x$(j,4)<>" " THEN LET e=
VAL x$(j)(2 TO 4)
8020 IF x$(j)(3)=" " THEN LET e=
VAL x$(j)(2)
8050 RETURN
9000 IF x+v<0 THEN LET v=-x
9040 IF x+v>255 THEN LET v=255-x
9050 IF y+w<0 THEN LET w=-y
9060 IF y+w>175 THEN LET w=175-y
9080 RETURN
9500 IF e$(2)="1" THEN GO SUB 20
00
9520 IF e$(2)="2" THEN GO SUB 30
00
9530 IF e$(2)="3" THEN GO SUB 40
00
9540 IF e$(2)="4" THEN GO SUB 50
00
9550 IF e$(2)="5" THEN GO SUB 60
00
9560 IF e$(2)="6" THEN GO SUB 70
00
9570 RETURN
```

UTILITY DESIGNER

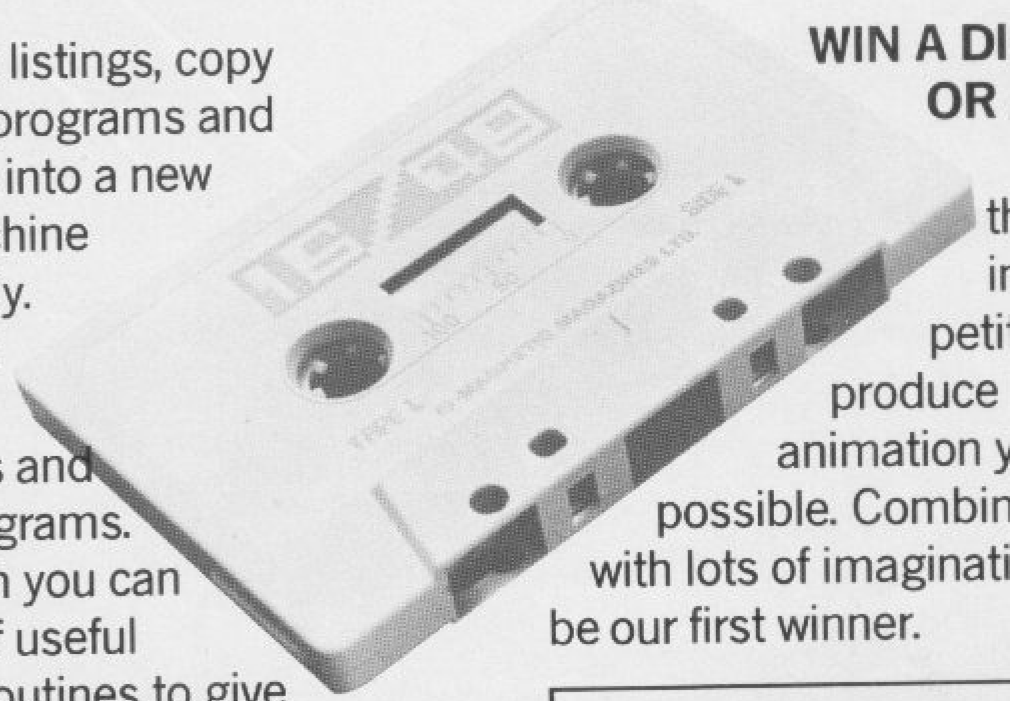




MARC POULAUD of York wrote **Utility Designer** for the 16K Spectrum, allowing a user to design large three-dimensional objects. The objects can have from three to 13 sides, or be round. Type-in the horizontal radii of the half cross-section, which go up automatically in 10-pixel sections. After a pause a 3D representation of the object will be drawn.

```
  2 REM  design by MARC POULAUD
 10 BORDER 0: PAPER 0: INK 5: C
LS
 20 PRINT INK 4; FLASH 1;AT 0,9
;"shape designer"
 30 PRINT AT 6,5;"ENTER YOUR DI
MENSIONS AND ";AT 7,4;"EACH WILL
 BE PLOTTED IN 10";AT 8,4;"PIXEL
 SECTIONS,OF THE HALF";AT 9,4;"C
ROSS SECTION"
 40 PRINT AT 13,5;"PRESS ANY KE
Y TO CONTINUE"
 50 PAUSE 0
 60 CLS
 70 PRINT AT 0,7;"HOW HIGH (max
-14)"
 80 INPUT x
 90 IF x>14 OR x<1 THEN GO TO 8
0
100  PRINT AT 2,2;"IF YOU WANT
A SPECIFIC NUMBER";AT 3,1;"OF SI
DES ENTER THAT NUMBER OF";AT 4,1
;"SIDES OR IF JUST CIRCULAR ENTE
R '14'": INPUT l: IF l<3 OR l>14
 THEN GO TO 100
110 CLS
120 DIM a(16): DIM x(15,x): DIM
y(15,x): LET c=-10
130 PLOT INK 2;0,0: DRAW 0,(x*1
0)-10: PLOT 0,0
140 BRIGHT 1
150 FOR a=1 TO x
160 INPUT b
170 LET a(a)=b
180 IF a(1)>70 THEN GO TO 160
190 IF a(a)>120 THEN GO TO 160
195 IF a(14)>80 THEN GO TO 160
200 DRAW b-PEEK 23677,10+c-PEEK
 23678
210 DRAW 0-PEEK 23677,10+c-PEEK
 23678
220 DRAW b-PEEK 23677,10+c-PEEK
 23678
230 LET c=c+10
240 NEXT a
250 PRINT AT 0,1;"PLEASE WAIT W
HILE I COMPUTE.";AT 1,2;"THIS IS
 TO ENSURE MAXIMUM";AT 2,9;"DRAW
ING SPEED"
260 LET o=10
270 LET b=1: LET d=1
280 FOR c=0 TO l
290 LET x(b,d)=140+a(d)*SIN (c*
2*PI/l)
300 LET y(b,d)=o+(a(d)/4)*COS (
c*2*PI/l)
310 LET b=b+1
320 NEXT c
330 IF d=x THEN CLS : GO TO 370
340 LET d=d+1: LET b=1: LET o=o
+10
350 GO TO 280
360 IF INKEY$="Y" THEN CLS : GO
 TO 370
370 LET a=10
380 LET b=1: LET d=1
390 FOR c=0 TO l
400 IF c=0 THEN PLOT x(b,d)-20,
y(b,d)+14
410 DRAW x(b,d)-20-PEEK 23677,y
(b,d)+14-PEEK 23678
420 IF d>1 THEN DRAW x(b,d-1)-2
0-PEEK 23677,y(b,d-1)+14-PEEK 23
678: DRAW x(b,d)-20-PEEK 23677,y
(b,d)+14-PEEK 23678
430 LET b=b+1
440 NEXT c
450 IF d=x THEN GO TO 480
460 LET d=d+1: LET b=1: LET o=o
+10
470 GO TO 390
480 PRINT AT 0,0;"PRESS";AT 1,0
;"ANY";AT 2,0;"KEY";AT 3,0;"TO";
AT 4,0;"CONT."
490 PAUSE 0
500 CLS
510 PRINT INK 2;"        NEW ONE
?"
530 PAUSE 0: CLS
540 IF INKEY$="y" THEN GO TO 70
550 PRINT INK 2;AT 5,0;"       T
HE SAME ONE ?"
560 PAUSE 0
570 IF INKEY$="y" THEN CLS : GO
 TO 370
580 CLS : PRINT INK 2;AT 10,0;"
      BYE !"
```

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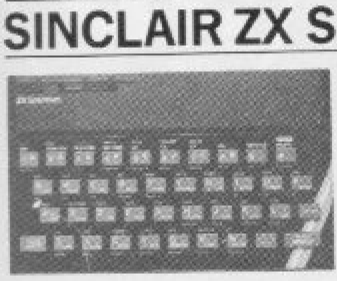


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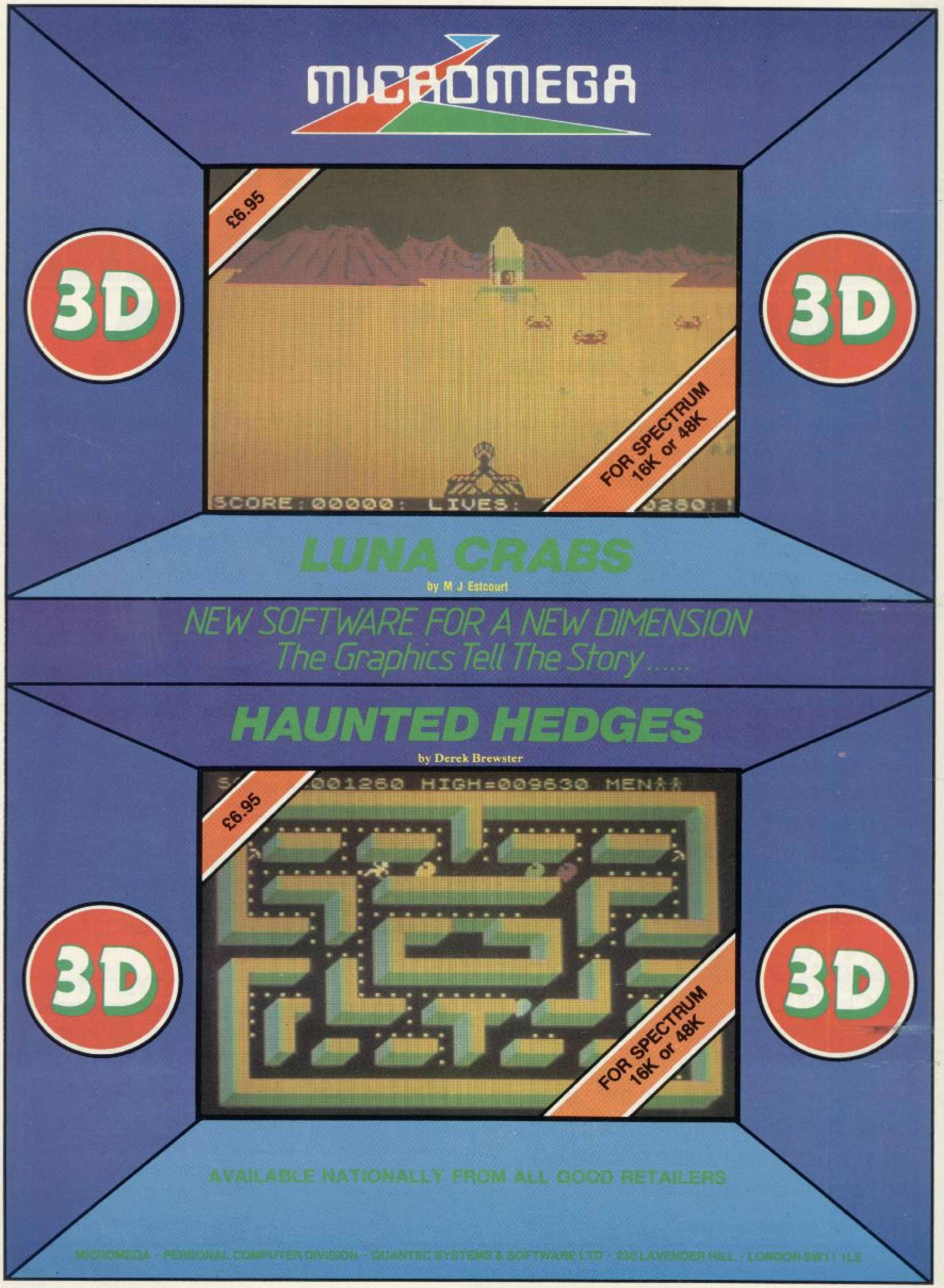
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Getting the ZX-81 to do things others cannot

Robert Entwistle and his family are spreading the word about Sinclair's second machine. Claudia Cooke reports on their success

ROBERT ENTWISTLE and his family have a ZX-81 but you would not think it to hear them talk. They are lying, you would think, because their computer does things a ZX-81 cannot do.

True, but that is because Entwistle has adapted it to suit his family needs. All those games for two players, for instance, the Entwistles did not think much of them because they involve two people hovering irritably over one small keyboard.

Instead, Entwistle bought two second-hand keyboards, one for each player to hold in his hand, and built a circuit connecting them to his ZX-81. He is a value engineer by profession and was helped considerably by his familiarity with digital circuitry; but that is not all he has done.

His computer can play tunes, because of an I/O port connected to a loudspeaker which he has attached to the computer. When he wanted to increase capacity from 1K to 2K, he fitted the new chip. "Easy, and much cheaper than buying the whole thing".

The musical side of the computer is the best part for 42-year-old Entwistle. Never having studied a musical instrument, nor learned to read music, he nevertheless bought a concertina which he has since taught himself to play.

"Because I cannot read music, the musical editor in my computer has helped enormously. I program it to play a certain tune for me and then I can learn it by ear, rather than going slowly through each note from the sheet music. It helps because it tells me at once what the music is trying to do and what it should sound like", he says.

Entwistle bought the concertina because it was an apt instrument for accompanying song. He admits that had he known anything about music, he might have chosen a different, easier instrument.

As it is, he has persevered and now plays regularly with his local Morris band, the Gloucestershire Morris Men. That, in turn, has led to a deeper involvement with the band and he now dances with it, too.

"It's great fun and has turned into a hobby for me. We perform locally most of the time but we go further afield on occasions, too".

Entwistle believes now in the value of music and his three children — James, aged 16, Charlotte, 13, and 11-year-old Alice — have learned to play the violin, piano and recorder. They also play variously the guitar, mandolin and other instruments.



The computer, too, has added another dimension to his children's lives. Entwistle and his wife Catherine decided to buy one two years ago specifically so that their children could become familiar with its operation and its potential.

"The response has been varied, I must say. Charlotte is not interested; she and my wife will play a game under sufferance but that is about all. Alice is keen and will type-in a program from a magazine and then play it. My son James uses it a great deal. He will read through the programs in a magazine and then write his own, with improvements."

Entwhistle and his son write almost all their own programs and their first attempt with the ZX-81 was with a program they had written.

"By writing your own program you really have to understand what it is doing. Having to solve problems helps you to understand. It certainly was not easy. We wrote a game of Duckshoot and now we have about four versions which work with varying degrees of success".

They also have several other games, a program of electronic organ music and one which plays the tune *Yellow Submarine.* James is also working on a program which is a map of England charting the movements of the various ancient tribes. He hopes to ascertain from it how the climate affected geographical prosperity among the tribes and how that relative prosperity was responsible for the movement of each tribe around the country, or eventual annihilation.

It is an ambitious project for a boy who has never done computer studies at school, despite the fact that his school has 10 computers. His father says: "I am not happy that so many schools are not teaching pupils about computers. You really need one keyboard between two children for it to work properly; it is no use having a handful of computers and several hundred children".

James has become so well-versed in computing since the advent of the ZX-81 in his Cheltenham home that he is now doing a computer project for the Duke of Edinburgh Silver Award scheme.

The Entwistles have progressed to a 16K RAM pack and feel there is no need to buy anything bigger as they are still exploring its full potential. James recently had a German boy staying for a week on an exchange visit and the visitor had to be restrained from buying a ZX-81 on the spot. He had seen one at a friend's house in Germany but had thought it looked uninteresting until he arrived at the Entwistle home.

Alice, too, is doing a good promotion job at her primary school, where she proved invaluable when the teacher decided to give lessons on computers. It seems she did half the teaching.

For Entwistle, the concept of computers is not new. He first had contact with them while he was reading physics at Southampton University. He went on a one-week computer course and remembers learning on a Pegasus.



"No-one will even know about the Pegasus now and things have certainly changed a great deal since then. Even so, the course was helpful in allowing us to understand what a computer can do," he says.

Entwistle's next contact with computers was at work, in his job as value engineer for Smiths Industries, just outside Cheltenham.

"We were having difficulty getting the adjustments correct while making an altimeter. We were not getting the proper number of instruments made and it was costing a packet. We tried a calculator and that was not enough, so we got a Hewlett-Packard 9825. I was given the computer and the manual and told to sort it out.

"I had no one to turn to and I spent about three months working it out and writing the program. We had the computer work out the exact adjustments we needed to make to the instruments, like how many turns for each screw.

"After about the third attempt it solved everything. We had 15 men making that one type of altimeter and the team went down to nine as soon as the computer arrived. Now we have an HP85 for setting-up pilot display units and we use a computer for automatic tests, too. It has made an enormous difference," he says.

Entwistle is critical of a good deal of software on the market because, he says, it caters only for people who already understand what they are doing.

"One of the things I like about the ZX-81 is that it stops you if you program an incorrect line. Some of them let you put in the whole program before you discover it is incorrect. Then you still do not know where you have gone wrong".

'One of the things I like about the ZX-81 is that it stops you if you program an incorrect line. Some of them let you put in the whole program before you discover it is incorrect.'

At work, Entwistle looks forward to the time when computers, used as a database, can all be linked for more efficient access to information. Already computers have changed the look of things. "You used to see people with soldering irons and breadboards all over their workbenches. Now it is all keyboards".

There is also a microcomputer club where Entwistle works and he and his children attend the regular monthly meetings to swap ideas and learn new approaches. The club also has a Dragon and a Vic-20 which members can borrow and take home.

Altogether, it has created a new world for the family, a world which is educating them as they play.

Entwistle has always been mechanically-minded and built a four-valve radio when he was 14, followed by a radio-controlled model car. "It would jam all the CB if I switched it on now", he laughs.

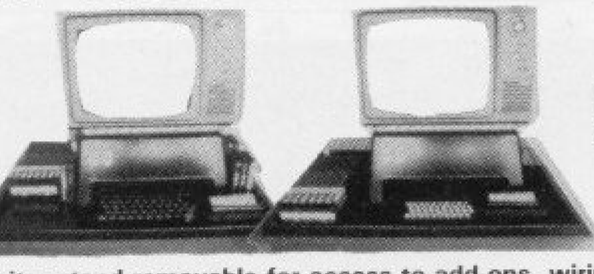
He would not advise his children to make a career in computers, because he believes computers will become part of most careers anyway, whether accounting, medicine or anything else.

"I expect my children to recognise the difference between good and bad software. You hear them at the homes of friends criticising the games and listing all the possible improvements," he says. When his daughter asked for a particular board game for Christmas, he wrote a program of it for the computer instead.

The computer does not rule their lives; they do not use it every day but together Entwistle and his son are learning more and more as they explore the seemingly limitless potential of the ZX-81.

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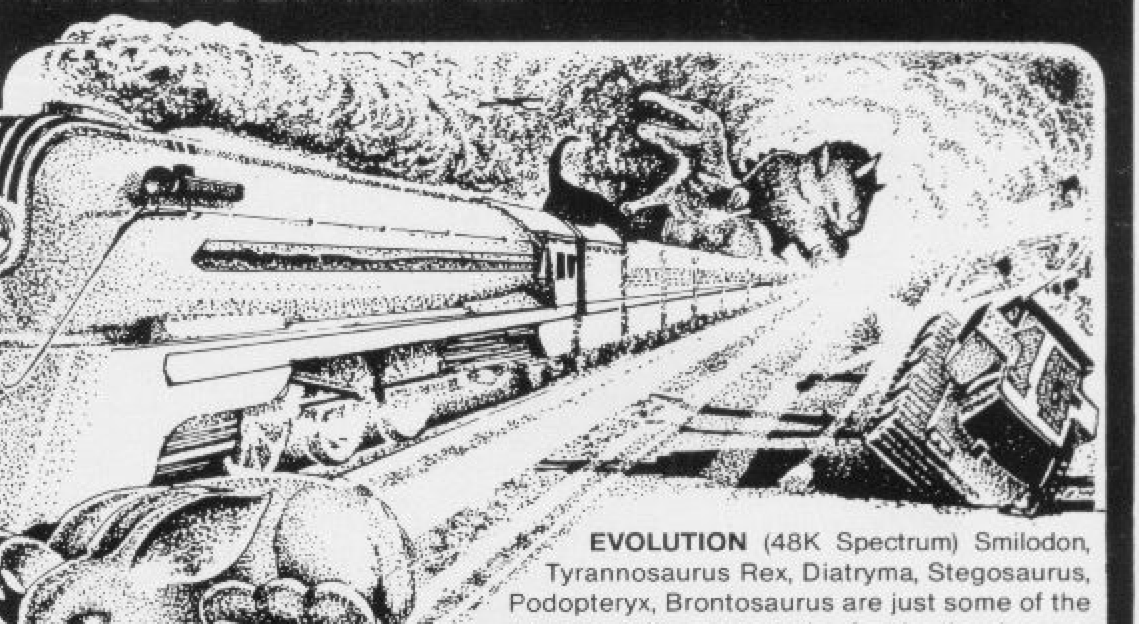
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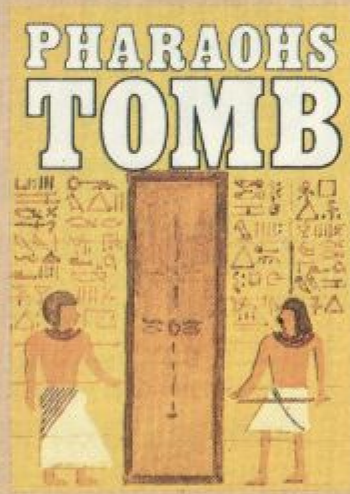
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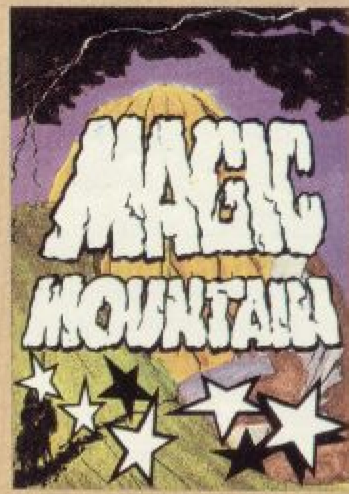
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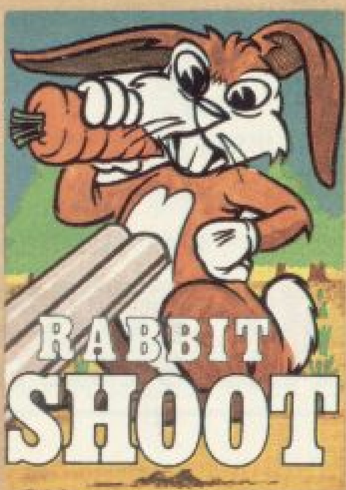


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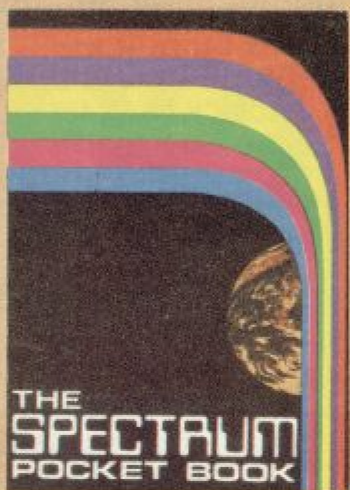


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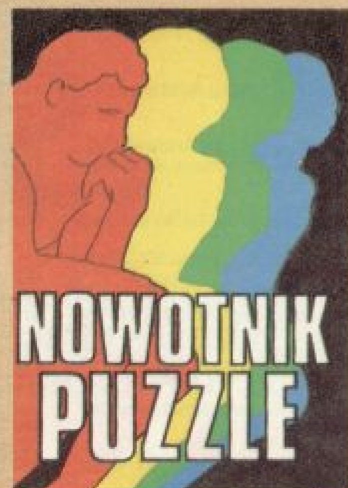
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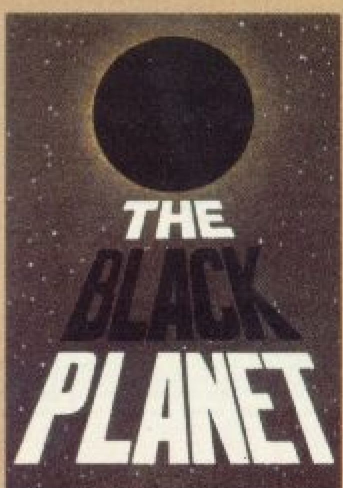


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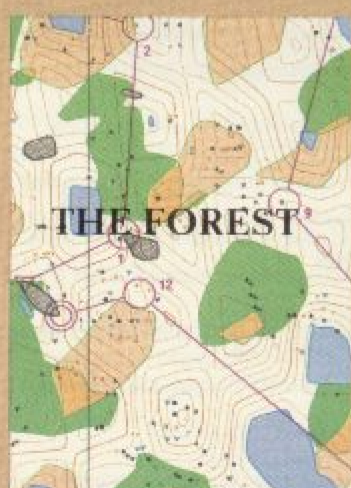
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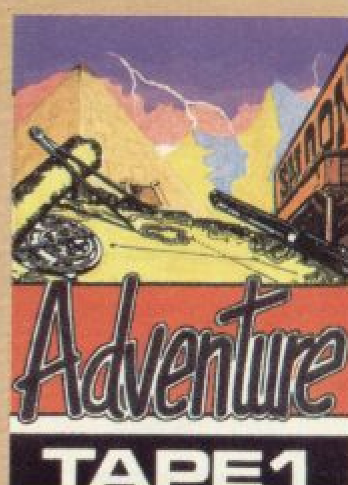


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Controlling the Stack is vital in new language

LAST MONTH I introduced Forth and described the various Forth packages which can be obtained for use on the ZX-81 and Spectrum. The Abersoft Forth package is the one I shall be using but the other packages, such as that from Artic, can be used to follow this series.

Abersoft Forth is capable of holding more than one screenful of program in memory at the same time and it is the one which has been recommended by the Forth Interest Group.

This month I explain the main structures which are used to write Forth programs and show why the language is so popular with the microcomputer industry.

Forth operates using an area of memory called the Stack. It can be represented as in figure one onwards. You can see that the Stack grows from one storage unit when something is put on to it to as many as the computer can handle in its memory space. When the computer takes information off the Stack it will shrink until, at the end of the program, it will probably contain nothing.

The computer puts information, usually numbers, on to the Stack in a certain way and it is that which often causes problems for the first-time user. In figure one the computer has put the number 2 on to the Stack. In figure two another number, 3, has been added and

2

Figure 1.

3
2

Figure 2.

+
3
2

Figure 3.



the number 2 has been moved down to make room for the newest bit of information on the Stack.

When information is taken off the Stack, the last bit to go on will come off first. For that reason the Stack is said to be a FILO — First In Last Out — structure. Machine code programmers may find the concept familiar, as the computer also has its own internal Stack on which it stores information about the system. That can be manipulated by machine code programs but is a very risky procedure.

In some cases if you do not take everything off the machine Stack before the end of a machine code program the machine will crash. In the same way you may get strange results if you do not control the Forth Stack properly.

As the Stack is a fundamental part of Forth and handles all the information which goes into the system it is necessary to change the way in which information is dealt with by the computer. That is especially true of the way in which Forth handles arithmetic operations. The machine needs to know which arithmetic operation it is to perform before it gets the data on which it is to work. In the last example the data was 2 and 3 and those numbers were put on to the Stack in figures one and two. The arithmetic operator is the symbol which tells the computer what to do with the two numbers. Valid operators include *, —, ↑ but the one used in this example is the + sign. That is put on to the Stack after 2 and 3 — figure three.

When the computer takes an item off the Stack it will find the + sign and know that the next items on the Stack are to be added together. The sum would normally be written as

2 + 3

but in Forth it is written as

2 3 +

The numbers are first, followed by the operator.

You can enter that sum into the computer in two ways. You could type-in the following instructions.

2 (ENTER)

3 (ENTER)

\+ (ENTER)

The other way is to type

2 3 +

putting spaces between the 2, 3, and the + sign. Every piece of information should have a space before or after it, so that the computer can distinguish between one bit and another.

The information is then on the Stack but nothing has been done with it. It will remain there until something else is put on to the Stack or until something is taken off.

To calculate the sum of the two values put on to the Stack in figure three, the Forth print instruction can be used. That is a dot, (.). If you have set up the sum on the Stack all you have to do is to type

(ENTER)

and the answer will appear on the screen, followed by the message 'ok'.

The computer will not display the results of the calculation until you use the print symbol. You can also put the ' ' on the same line as the calculation instruction instead of typing it in separately. That would make the full calculation instruction

3 2 +

and would give the answer

5 ok

That type of instruction is satisfactory if you want to perform one calculation and know the answer immediately, but by using it you can do nothing further.

The instructions used so far have had immediate results and therefore they are operating in what is termed the immediate mode.

An extension of that is the compile mode and it is in that where the full power of the Forth language can be realised.

If you type VLIST into the computer a block of words will scroll up the screen. The command VLIST means vocabulary list and the words displayed are those which are already known by the computer. Words such as UDG and FREE describe functions which can be performed by the computer. Those words operate in a similar way to Basic keywords but they are much more flexible and need no line number to reference them.

The word is the Basic unit of Forth programs. When a word is used the computer will perform a series of actions which are associated with it. For instance, if you type-in

FREE .

the number of RAM bytes which are left free for your programs will be displayed. A beginner may find it difficult to understand the potential of Forth word structures, as they can be used as programs.

That is not possible using the Basic language although it could be likened to calling one subroutine of Basic lines from within another. Forth word structures can also call themselves but that is something which will be explained in another article.

The words which are in the dictionary, or vocabulary, when the language is initialised are small routines which have been built into the language by the original author. Usually they cannot be changed. It is possible, however, to set up your own routines and add them as words to the dictionary. That is done in the compile mode.

In the previous example the number of bytes left for programming in the basic system was determined by typing

FREE .

That produces a number with no reference to bytes. You may want to put in a printed message before or after the number, such as

NUMBER OF BYTES FREE =

That is a very simple process and you can define a word which will do it.

First the computer needs to be told that a new word is about to be defined for the dictionary. That is done by typing a ':' — colon — at the beginning of the first line of the word. That will put the computer automatically into the compile mode and it will wait until you have typed-in your word definition.

'Computer must be told the definition has been completed'

Next, and on the same line of program, you must define the name of the word. The word in this example will be called BYTES as it is best to use one which describes the operation which will be performed with its use.

The message to be displayed can be programmed by telling the computer that it has to print what follows. That is done by putting a print dot after the name of the word and then enclosing the message in quotation marks.

That instruction is slightly unorthodox, as no space is put between the print dot and the quotation mark. Spaces, however, are put between the quotation marks and the message.

After you have typed-in the message, closed-off with a space and quotation mark, you must use the word FREE to calculate the space which is free in the system. Another print dot, after that word, must be used to display the result.

The computer must be told that the definition has been completed and that is done by typing a semi-colon, ';', after the definition.

As you can see from figure four, the complete program can be entered in two ways. You can either type-in the word definition as one long line or you can type it in as a series of lines separated by (ENTER). The constituent parts of the definition have also been included in figure four to make it easier to understand.

There are two ways in which you can see if your new word has been defined by the computer. You could type-in the word BYTES followed by the (ENTER) key and the display should then read

NUMBER OF BYTES FREE = 16512

or the number of bytes which are available to your machine.

Alternatively, you could type VLIST to look at the vocabulary. If your word has been defined correctly you should see it as the first term in the dictionary. As you can see, each new word is entered at the top of that dictionary.

You can use BYTES as a program on its own or you could use it within another word definition, as FREE was used in BYTES to calculate the number of bytes. That is one of the reasons why Forth is regarded as so flexible and why interest in it is growing.

Next month I will examine the ways in which words can be stored in the computer memory using pages of RAM which are called screens. Other Forth words, defined by the computer, will be discussed and some similar applications will be suggested for this versatile language.

```
: BYTES

." NUMBER OF BYTES FREE= "

FREE , ;
```

(a) word definition on several lines

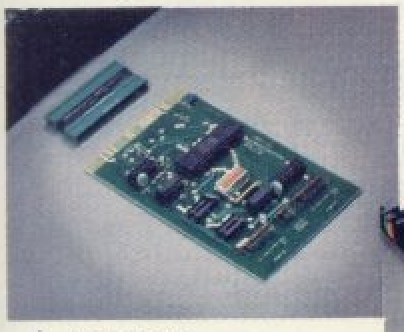
```
: BYTES ."NUMBER OF BYTES
FREE= "
FREE .
```

(b) word definition entered as one line

```
:/BYTES/" /NUMBER OF BYTES
FREE=/
"/FREE /.
```

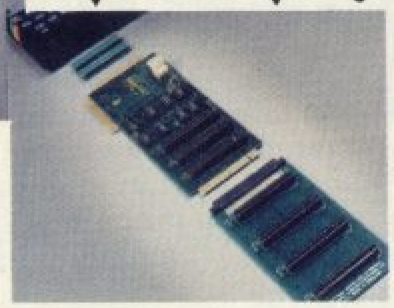
(c) break-down of definition separated by '/'.

Figure 4.



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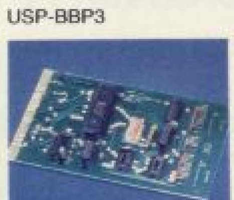
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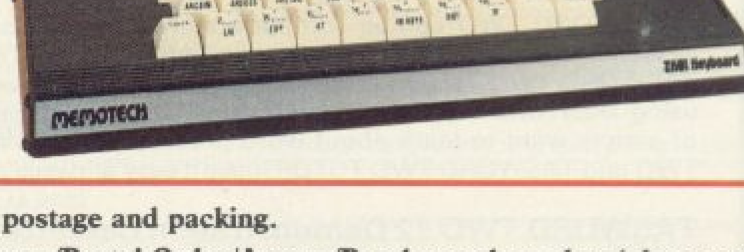
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The ticket to a new world of colour is a user-defined graphic. It will be easier to describe its use once it has been set up. So:

Before NEW-ing — as you know, the graphic will remain until the micro is turned off — check, by going into graphics mode and pressing "P", that you have a miniature chequer-board. INK will be applied to the 1s and PAPER to the Os to mix the new colours.

The first program streaks the new colours across the screen in varying widths. The choice of INK and PAPER is random. With regard to the listing, you will see that it is not necessary to use the INT function with RND for INK and PAPER as they round to the nearest whole number. In ensuring that the numbers — and thus INK and PAPER — are not the same it is necessary — line 20 — to add .5 and INT, as rounding-down only would not be very useful, nor would comparing numbers such as .0011182370 and 0.82150369.

```
   1 REM LISTING 1.
  10 LET A=BIN 10101010: LET B=B
IN 01010101
  20 FOR X=0 TO 7
  30 READ D: POKE USR "P"+X,D
  40 NEXT X
  50 DATA A,B,A,B,A,B,A,B

   1 REM LISTING 2.
   2 REM ***STREAKER©***
  10 LET A=RND*7: LET B=RND*7: L
ET C=INT (RND*3+1)
  20 IF INT (A+.5)=INT (B+.5) TH
EN GO TO 10
  30 FOR J=1 TO C
  40 FOR K=0 TO 31
  45 REM GRAPHICS "P"
  50 PRINT INK A; PAPER B;"▒";
  60 NEXT K
  70 NEXT J
  85 REM AUTOMATIC SCROLLING
  90 POKE 23692,-1
 100 GO TO 10

   1 REM LISTING 3.
   2 REM ***TESTCARD©***
   5 BORDER 2
  10 PRINT '' TAB 5; BRIGHT 1;"C
AN YOU MIX COLOURS?"
  20 PAUSE 50
  30 FOR A=1 TO 6
  40 FOR B=A+1 TO 6
  50 PRINT AT 7,4;"THEN WHAT DO
THESE MAKE"
  60 PRINT TAB 1;"(WHEN READY-PR
ESS ""Y"" TO SEE)?"
  70 PRINT ' TAB 12; INK A;"■■■"
; INK 0;"+"; INK B;"■■■"
```

The random variable C sets the width of the colour band. The POKE in line 90 sets automatic scrolling.

The next program, be assured, is easier on the eyes if not on the mind. How good are you at deciding, when shown two colours, what the result of the mix will be? With the next program you can learn.

If your want to look longer at a particular mix there is just time after the warning beep to operate BREAK.

> 'The Spectrum will go through the colours and mix them with each other'

The A-loop sets in turn the INK numbers 1 to 6 while the B-loop sets against each the PAPER numbers, always one more so there is no duplication of INK and PAPER or a repeat of mixes already shown. The PAUSE in line 80 holds down INKEY to prevent it flashing across the keyboard without giving you time to call-up the answer, let alone try your own first. Line 100 allows for miskeying.

Now for the full range of colours of which the Spectrum is capable. Not only will black and white be included but also BRIGHT which produces its own distinct hues.

The next program will first print the two basic colours the micro has been told to select, together with their numbers on the keyboard. The screen will begin to fill rapidly with the result of the merging. Then halfway down BRIGHT will be switched on, so that not only can a fresh tint be seen, but the marked difference between BRIGHT 0/1 can be compared.

The Spectrum will go through the colours on the keyboard and mix each with all the others — duplications have been written out. Again there is a brief pause after the warning beep if you want to hold a screen.

The number of newly-created colours the Spectrum produced was 56 — that is 28 plus 28 with BRIGHT on.

Although it has been entertaining to see the colour capability of the Spectrum, can the new colours be used in graphic displays? The answer must be a qualified yes. Some of the new colours tend to be unstable in that they do not seem to be able to stay still. Also, as the Spectrum can display only two colours to a character square there would be difficulties if something with curved lines were set against, for instance, a blue sky.

The edges of the graphics would be showing the PAPER colour, so that an orange sun would be fixed within a frame of red or yellow. That problem would disappear if the graphic allowed for the PAPER to match the background. Graphics composed of complete squares such as tower blocks of sales figures for each month should certainly be possible using the new colours.

The Spectrum has an astonishing array of colours, as we have proved — considerably more than eight — but the question remains as to who said the Spectrum had eight colours?

```
  80 PAUSE 9999
  85 REM GRAPHICS ARE "P"
  90 IF INKEY$="Y" THEN PRINT TA
B 15;"↑";TAB 12; INK A; PAPER B;
"■■■■■■■■";
 100 IF INKEY$<>"Y" THEN GO TO 8
0
 110 PAUSE 100
 120 BEEP .1,0
 130 PAUSE 100
 140 CLS
 150 NEXT B
 160 NEXT A
 170 FOR A=1 TO 10
 180 BORDER RND*6
 190 BEEP .1,A: BEEP .1,10-A
 200 NEXT A

   1 REM LISTING 4.
   2 REM ***MIXER©***
  10 FOR A=0 TO 6
  20 FOR B=A+1 TO 7
  30 PRINT A;">"; INK A;"■"; INK
 0;"+";B;">"; INK B;"■"; INK 0;"
(BRIGHT 0/1) ="
  40 FOR X=1 TO 672
  45 REM GRAPHICS "P" & ";"
  50 PRINT INK A; PAPER B;"▒";
  60 IF X=336 THEN BRIGHT 1
  70 NEXT X
  80 PAUSE 100
  90 BEEP .1,0
 100 PAUSE 100
 110 CLS : BRIGHT 0
 120 NEXT B
 130 NEXT A
 140 FOR A=10 TO 1 STEP -1
 150 BEEP .1,A: BEEP .1,A*2
 160 NEXT A
```

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...ures. The ...ied plot ...erior to any ... for the

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"This is an impressively packaged Adventure game which makes good use of the Spectrum's colour graphics. They have not only produced one of the best games for the Spectrum, but given everyone else a lesson in good game design."

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"I am the owner of a copy of 'The Hobbit' which is wonderful entertainment, and very challenging. I have other tapes and publications of yours, all of which are excellent."

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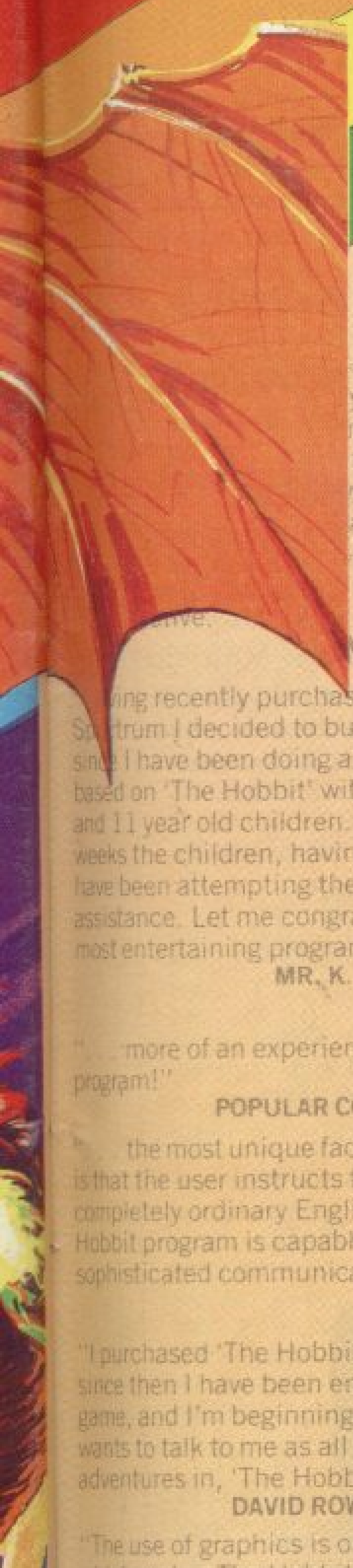


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...d for my ZX ...you supply called ...n excellent ...the money. I find ...ery realistic. The ...accurate. It sticks ...e book, which is a ...it very compelling ...ctive.
...VEN CASSIDY, Essex

"...ing recently purchased a Sinclair Spectrum I decided to buy 'The Hobbit' since I have been doing a literature project based on 'The Hobbit' with my class of 10 and 11 year old children. Over the last 10 weeks the children, having read the book, have been attempting the program with my assistance. Let me congratulate you on a most entertaining program."
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"... the most unique factor of this program is that the user instructs the computer in completely ordinary English sentences. The Hobbit program is capable of very sophisticated communications ...."
ZX COMPUTING

"I purchased 'The Hobbit' not long ago and since then I have been engrossed in the game, and I'm beginning to think no-one wants to talk to me as all I talk about is my adventures in, 'The Hobbit'."
DAVID ROWLEY, Stoke-on-Trent

"The use of graphics is one of the features which makes The Hobbit special. The addition of graphics as good as these adds a whole new dimension to the Adventure. It is certainly a marvellous game, which should set the standard for future Spectrum adventures."
ZX COMPUTING

"...ulate you on a ... I have enjoyed ...ensely. I must thank you ...oducing such a clever product, it was worth every penny of the purchase price."
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"'The Hobbit' is a beautifully constructed, frantically-maddening, tortuous, gloriously inconsistent, thoroughly spooky adventure - far better than I could have hoped for and certainly the finest of the dozen or so adventure programs I have. In short, I congratulate the four who sweated for a year and a half to concoct such a super result."
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"Nothing is certain in this Adventure, but uncertainty! Add to this the brilliant graphics that are used to describe many of the locations and we have an Adventure that is going to become a classic for the Spectrum.
POPULAR COMPUTING WEEKLY

"I am writing to congratulate you on your excellent program 'The Hobbit' for the Spectrum. I wake up in the middle of the night with an idea and have to load the adventure to try it out."
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Complex maths performed by the simple ZX-81

Complicated calculations can be done with these listings to provide a useful expansion of the capabilities of the Sinclair machine

THIS IS a program for the 16K ZX-81 which will enable the user to perform some complex mathematical calculations, aided by a graphical display. It would be able to find at least one root for a polynomial equation of any degree and at the same time plot the graph of the equation, find the definite or indefinite integral, or differentiate the equation with respect to X.

The program is almost entirely Basic with only a few machine code subroutines. The reason is that it is very difficult to handle floating point arithmetic in machine code and it would be a very limited program if it were only to use the Z-80 integer arithmetic facilities.

I have subdivided the program into several routines; I shall explain each individually so that the program can be understood easily. Here is a list of these routines:

Line 1 — Various machine code subroutines, stored in a REM statement.
Lines 4 to 6 — The re-start routine.
Lines 10 to 130 — The initialisation process.
Lines 300 to 360 — The select routine.
Lines 500 to 996 — Some important subroutines.
Lines 1000 to 1180 — The graph plotting routine.
Lines 2000 to 2310 — The equation-solving routine.
Lines 3000 to 3090 — The differentiation routine.
Lines 4000 to 4340 — The integration routine.
Lines 5000 to 5120 — The Sigma evaluation routine.

All the machine code subroutines do is draw things on the screen. Do not worry if you do not understand them; they are not an important part of the program and their functions could easily be replaced by longer and less efficient Basic subroutines. The first thing to do is type:

1 REM 110 characters.

Then enter this Basic program:

```
10 LET X=16514
20 INPUT A$
30 IF A$="" THEN INPUT A$
40 POKE X,16*CODE A$+CODE A$(2)-476
50 LET X=X+1
60 LET A$=A$(3 TO)
70 GOTO 30
```

Run this and enter the following machine code to the input string: 2A0C40 111000 19 112100 0617 361B 19 10FB 2A0C40 116C01 19 0620 361B 23 10FB C9 76840303057600860000768701000476 0303030176FF 21A240 5E 7B FEFF C8 D7 23 18F7 7600077600057600 0576870576FF 21C440 5E 7B FEFF C8 D7 23 18F7 FD367BFF CF00.

You can then delete lines 10–70 because their purpose was only to enter the machine code.

After the program has finished the user will receive a report of 1/4. If he keys CONT the program will re-start with the same data; if he keys RUN the program will re-start and he will be prompted for new data. The routine which does it is:

```
4 IF PEEK 16507=0 THEN RAND USR 16606
5 POKE 16507,0
6 GOTO 300
```

Now for the initialisation process. The equation will store the coefficients of X^n in the array P(n,1) and the corresponding exponents in the array P(n,2). When entered into the computer, an equation must be of the form Y = polynomial in X. When the equation is being solved for an unknown, x, Y must be equal to nought, and during Sigma evaluation Y should be ignored altogether.

You will notice that I have used Q as the control variable in the FOR-NEXT loop. I have done so in all my loops in the program to economise on memory.

$$\frac{-b\pm\sqrt{b^2-4ac}}{2a}=x$$

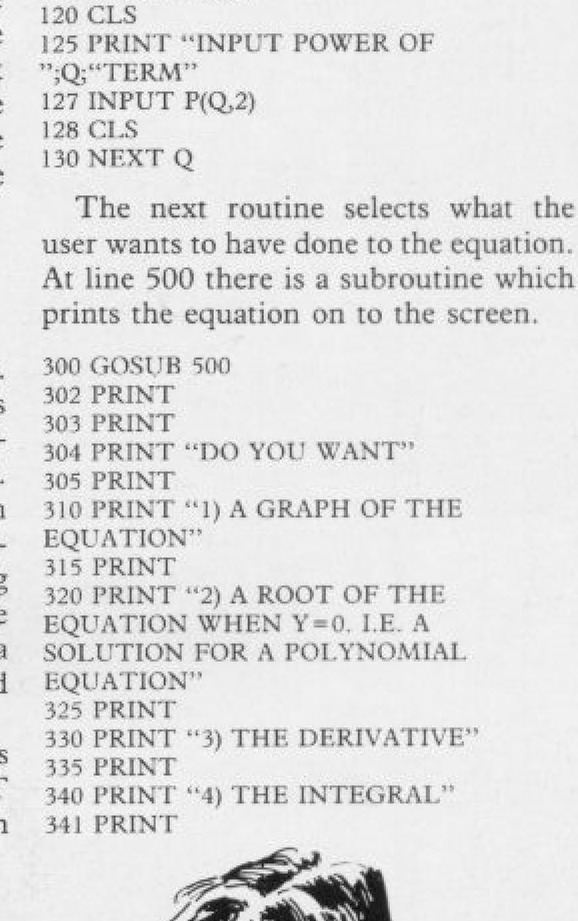
$$x_n+1=x_0-\frac{f(x_n)}{f'(x_n)}$$

$x^2-10x+25=9$
$x^2-10x+16$
$=0;$
2260 GOTO
2120
B.K.

```
10 POKE 16507,0
19 PRINT "A MATHEMATICAL
PROGRAM"
20 PRINT
30 PRINT "FIRST YOU MUST ANSWER
SOME QUESTIONS ABOUT THE
EQUATION"
40 PRINT
50 PRINT "HOW MANY TERMS ARE
THERE"
56 PRINT
60 INPUT A
70 DIM P(A,2)
80 CLS
90 PRINT "INPUT THE POLYNOMIAL
NOW"
100 FOR Q=1 TO A
110 PRINT "INPUT COEFFICIENT OF
";Q;"TERM"
115 INPUT P(Q,1)
120 CLS
125 PRINT "INPUT POWER OF
";Q;"TERM"
127 INPUT P(Q,2)
128 CLS
130 NEXT Q
```

The next routine selects what the user wants to have done to the equation. At line 500 there is a subroutine which prints the equation on to the screen.

```
300 GOSUB 500
302 PRINT
303 PRINT
304 PRINT "DO YOU WANT"
305 PRINT
310 PRINT "1) A GRAPH OF THE
EQUATION"
315 PRINT
320 PRINT "2) A ROOT OF THE
EQUATION WHEN Y=0. I.E. A
SOLUTION FOR A POLYNOMIAL
EQUATION"
325 PRINT
330 PRINT "3) THE DERIVATIVE"
335 PRINT
340 PRINT "4) THE INTEGRAL"
341 PRINT
```



```
342 PRINT "5) THE EVALUATION OF A
SUM"
350 INPUT G
353 CLS
360 GOTO G*1000
```

The subroutine at line 500 prints-out the contents of the array P by looping through it. Note, however, that a colon in the listing means 'to the power of' and that the display file is poked to over-write the last plus sign in line 535.

Some other subroutines we will need are one subroutine which differentiates the equation held in the array P and places the result in another array 0; a subroutine to plot a single point when the screen is divided into four quadrants; a subroutine which integrates the equation held in the array P and places the result in another array I; a subroutine which, given a value for X, will find the value of the polynomial expression held in the array P. The positions are lines 500, 600, 700, 800, and 900 respectively. Here is the listing of the subroutines:

```
500 PRINT "Y= ";
510 FOR Q=1 TO A
520 PRINT P(Q,1);"X:";P(Q,2);" + ";
530 NEXT Q
535 POKE PEEK 16398+256*PEEK 16399-
2,0
540 RETURN

600 DIM O(A,2)
605 FOR Q=1 TO A
610 LET O(Q,1)=P(Q,1)*P(Q,2)
615 LET O(Q,2)=P(Q,2)-1
616 IF O(Q,2)=—1 THEN LET O(Q,2)=0
620 NEXT Q
630 RETURN

700 IF ABS S>21 THEN RETURN
715 IF ABS X>31 THEN RETURN
730 PLOT X+31, S+21
760 RETURN

800 DIM I(A,2)
810 FOR Q=1 TO A
820 LET I(Q,2)=P(Q,2)+1
830 LET I(Q,1)=P(Q,1)/I(Q,2)
840 NEXT Q
850 RETURN
900 LET SUM=0
910 FOR Q=1 TO A
920 IF X<0 THEN GOTO 960
930 LET SUM=SUM+P(Q,1)*X**P(Q,2)
950 GOTO 995
960 IF INT(P(Q,2)/2)<>(P(Q,2)/2) THEN
GOTO 990
970 LET SUM=SUM+P(Q,1)*ABS X**P(Q,2)
980 GOTO 995
990 LET SUM=SUM+P(Q,1)*-(ABS
X**P(Q,2))
995 NEXT Q
996 RETURN
```

The last one may require some more explaining. If you try the sequence of direct commands LET X=−5; PRINT X**2 you will soon discover the inability of the ZX-81 to calculate negative numbers to the powers of things. In the above subroutine line 930 handles positive values of X, line 970 handles negative values of X and even exponents, and line 990 handles negative values of X and odd or fractional exponents.

The next routine plots the graph of an equation in the array P. To make things easier, I shall explain each portion as we proceed.

```
1000 LET X=31 Calculate the best scale ratio
when x=31
1001 GOSUB 900
1002 LET R1=21/SUM
```

> **'It is very difficult to handle floating point arithmetic in machine code and it would be a very limited program if it were only to use the Z-80 integer arithmetic facilities'**

```
1003 LET X=-31 Calculate the best scale ratio
when x=-31
1004 GOSUB 900
1005 LET R2=21/SUM
1006 LET R=(ABS R1+ABS R2)/2 Find the
average of the two.
1007 PRINT "THE SCALE RATIO 1(X/Y) IS
";R
1010 INPUT A$
1012 CLS
1015 RAND USR 16514 Draw the axes.
1016 FOR X=-31 TO 31 This is the main
loop
1018 IF X=0 THEN NEXT X
1019 GOSUB 900
1155 LET S=SUM*R Find Y coordinate
1160 GOSUB 700 Plot it.
1170 NEXT X Loop back.
1180 GOTO 4 Restart.
```

You can then test the program. If, for example, you wanted a graph of the equation $y=x^2+x-4$ you would do the following:

1) Type RUN 10
2) Enter 3 for the number of terms
3) Enter the numbers: 1;2; 1;1; −4;0 for the coefficients and powers of x — note that nought is used for the power of −4, because it can be written as $-4x^0$.
4) Enter one to select the graph plotting routine.
5) Press newline when the computer tells you the scale ratio.

That sounds like a complicated process but it is not once you are used to it.

The next part of the program solves

Figure 1.

```
2000 PRINT "DO YOU HAVE AN              Find out if the user has an approximation —
APPROXIMATE ROOT"                        otherwise use 1 as a guess.
2002 INPUT E$
2003 LET E$=E$(1)
2004 CLS
2005 IF E$<>"Y" THEN GOTO 2010
2006 PRINT "THEN INPUT IT"
2007 INPUT X
2015 LET X=1
2020 CLS
2025 GOSUB 600                           Take the derivative.
2100 PRINT "THE EQUATION IS BEING
SOLVED; THANK YOU FOR BEING SO
PATIENT"
2110 PRINT AT 15,0
2120 GOSUB 900                           Find the value of the polynomial.
2130 LET SUM1=0
2140 FOR Q=1 TO A                        Find the value of the derivative of the
                                         polynomial.
2150 IF X<0 THEN GOTO 2180
2160 LET SUM1=SUM1+0(Q,1)*X**0(Q,2)
2165 GOTO 2210
2180 IF INT(0(Q,2)/2)<>0(Q,2)/2 THEN
GOTO 2200
2190 LET SUM1=SUM1+0(Q,1)*ABS
X**0(Q,2)
2195 GOTO 2210
2200 LET SUM1=SUM1+0(Q,1)*-(ABS
X**0(Q,2))
2210 NEXT Q
2220 LET T=X                             T is used to test if X is correct to 8 sig. figs.
2225 IF SUM1=0 THEN POKE 16384,32        Calculate the new value . . .
2230 LET X=X-SUM/SUM1
2240 LET X=VAL STR$ X
2250 IF X=T THEN GOTO 2300               This is the test.
2260 GOTO 2120                           Loop back.
2300 PRINT "X=";X                        Output correct value . . .
2310 GOTO 4                              Restart
```

polynomial equations, provided they contain only one unknown and that one side is equal to nought. One way of doing it would be to equip the computer with many formulae for each type of equation. One example would be the well-known formula for quadratic equations:

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = x$$

where a, b, and c are the coefficients of x^2, x^1, and x^0 respectively.

That method would be memory-consuming and rather complicated — try working-out a formula for an equation with the highest term in x^{10} and you will appreciate the point. Instead we shall use the Newton-Raphson method, based on the equation:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

where f denotes the polynomial as a function, f' denotes the derivative of the function, and the higher the subscript n the more accurate the root, since the method is based on improving an approximate root until a desired degree of accuracy is obtained.

We will be calculating the root to eight significant figures. The only disadvantage of the method is that it takes a very long time. The routine to perform this time-consuming task is shown in figure one.

You can test the routine now. If you wanted to solve the equation $x^2 - 10x + 25 = 9$, you would first make the right-hand side equal to nought by

> **'We are calculating the root to eight significant figures which takes time'**

subtracting nine from both sides to give $x^2 - 10x + 16 = 0$; then you would enter the numbers in the normal way and use 2 to select the equation-solving routine; then, assuming you did not have an approximation, you would answer "NO" to the computer question and it would give 2 as a root for x. If instead you entered 10 as an approximation, you would obtain the alternative value 8.

The routines in figures two and three take derivatives and integrals. If you have not yet learned calculus, do not worry; you will still be able to use the program without these routines.

In mathematics if we wanted to express the sum of the cubes of the first 20 numbers we would write:

$$\sum_{r=1}^{20} r^3$$

which means "the sum of the values of the expression after the sigma, when r is taken to have the integral values between 1 and 20 inclusive".

The routine in figure three should make things clearer:

Finally, I shall leave you with the following problems:

a) Solve the equation $\frac{1}{x^2} + x = 3 + \frac{1}{729}$ — you should find at least two roots.

b) A body is moving in a straight line and t seconds after passing a point A in the line its velocity is $(3t^2 + 4)$ m/s. Find the distance moved by the body while its velocity increases from 31 to 112 m/s. Also calculate the acceleration of the body when it has moved 5m from A.

c) It is known that an enemy ship will be at a point P at precisely 15.08 and 45 seconds. Your submarine is exactly 21.97km. from that point. The acceleration of your torpedo has a rate of change of $\frac{6}{100}$. At what time exactly should you fire your first torpedo so that it arrives at P at the same time as the enemy ship?

d) Calculate the sum of the first 100 multiples of 4 squared.

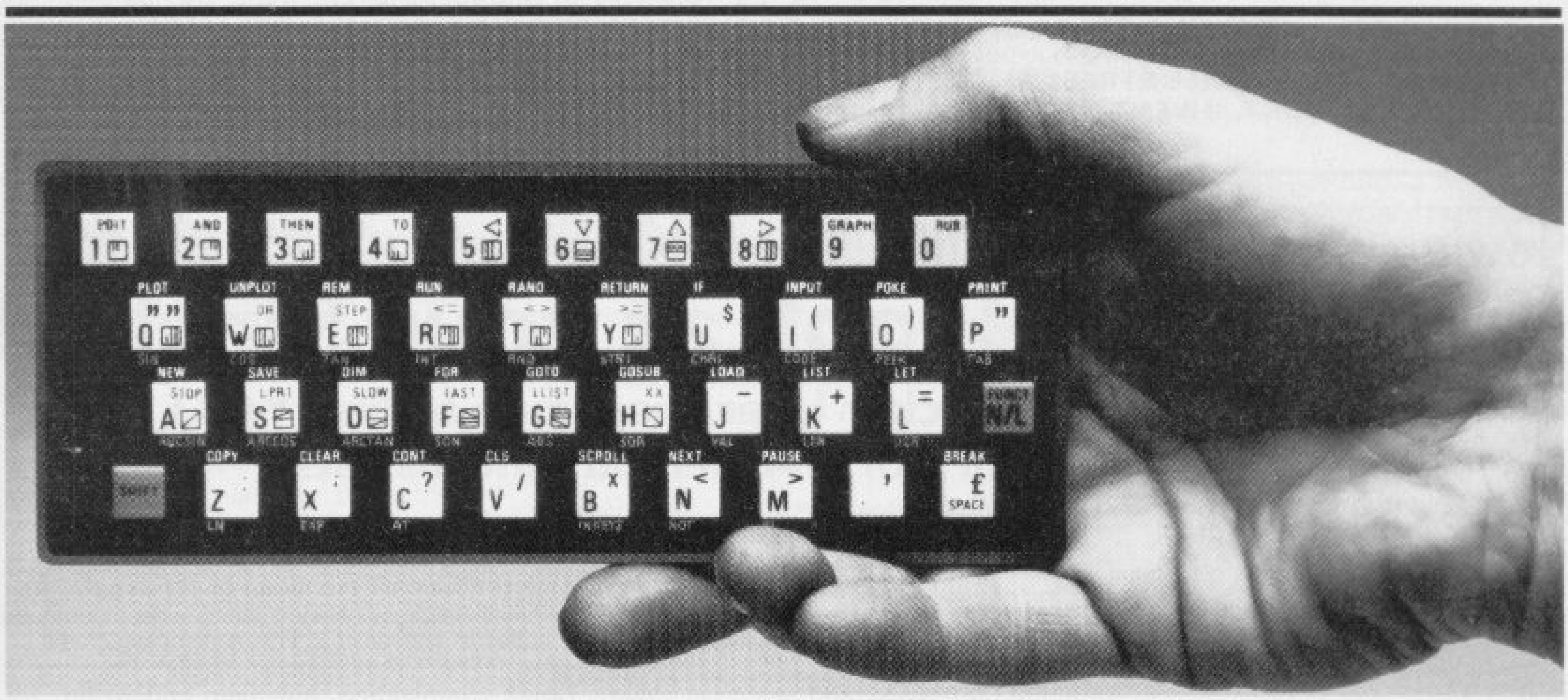
Figure 2.

```
3000 GOSUB 600                          Take the derivative
3010 FOR Q=1 TO A                       Transfer the equation in the
3020 LET P(Q,1)=O(Q,1)                  array O into the array P.
3030 LET P(Q,2)=O(Q,2)
3040 NEXT Q
3050 PRINT "DY"                         Output the derivative
3060 PRINT AT 2,0;"DX"
3070 PRINT AT 1,0;"__=";
3080 GOSUB 510
3090 GOTO 4                             Restart.
4000 GOSUB 800                          Take the indefinite integral
4010 FOR Q=1 TO A                       Transfer from I to P
4020 LET P(Q,1)=I(Q,1)
4030 LET P(Q,2)=I(Q,2)
4040 NEXT Q
4050 PRINT "DEFINITE OR INDEFINITE"
4060 INPUT B$
4070 LET B$=B$(1)
4080 CLS
4090 IF B$="D" THEN GOTO 4200           Does the user want it definite?
4100 RAND USR 16594                     Print an integration sign
4110 PRINT AT 3,4;"F(X) DX= "
4120 GOSUB 501                          Output the indefinite integral
4125 PRINT AT 6,0
4130 GOTO 4                             Restart
4200 RAND USR 16594                     This is for definite integrals . . .
4210 PRINT AT 5,0;"?"                   Input the two bounds
4220 INPUT B1
4230 PRINT AT 5,0;B1
4240 PRINT AT 0,1;"?"
4250 INPUT B2
4260 PRINT AT 0,1;B2
4270 LET X=B2                           Calculate the definite integral in
4280 GOSUB 900                          the usual way.
4290 LET B2=SUM
4300 LET X=B1
4310 GOSUB 900
4320 LET I=B2-SUM
4330 PRINT AT 3,4;"F(X) DX=";I          Output value and restart.
4340 GOTO 4
```

Figure 3.

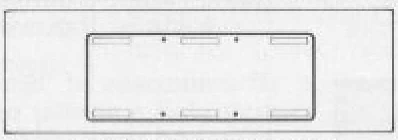
```
5000 RAND USR 16565                     Print a sigma.
5005 LET R=0                            R 'accumulates' the value.
5010 PRINT AT 5,0;"X=?"                 Input the two bounds.
5020 INPUT C
5030 PRINT AT 5,2;C, AT 0,1;"?"
5040 INPUT C1
5050 PRINT AT 0,1;C1
5055 FOR X=C TO C1                      This is the main loop.
5060 GOSUB 900                          Find the value of the expression
5070 LET R=R+SUM                        Add this on to R
5080 NEXT X                             Loop back, incrementing x.
5100 PRINT AT 2,5;"F(X)=";R             Output
5120 GOTO 4                             Restart
```

NOW. A ZX81 PUSH-BUTTON KEYBOARD FOR UNDER £10.

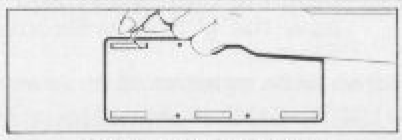




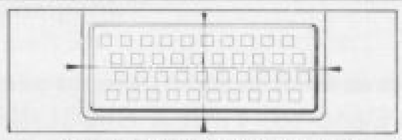
1. Make sure the original keyboard is clean and check that all the keys function.



2. The Buttonset is held in place by self-adhesive pads.



3. So all you do is remove the protective backing.



4. And place it centrally on your ZX81.

At last there's a really cheap but efficient way of ironing out the ZX81's only real bug: its keyboard. The Filesixty Buttonset offers:

■ A full-travel calculator-type moving keyboard for only £9.95. ■ Installed in seconds. The peel-off adhesive backing means you just register into position and press. ■ No messy labels, dismantling or soldering. ■ 3 groups of colour keys to pick out shift, numerals and newline. ■ Precision moulded in ABS to match your ZX81, with contrasting legends for maximum legibility.

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Cheques/PO made payable to Filesixty Ltd.

Please send me ________ (qty) Buttonset(s) at £9.95 each (including VAT and P&P).

Total £ ________ BLOCK CAPITALS

Name ________

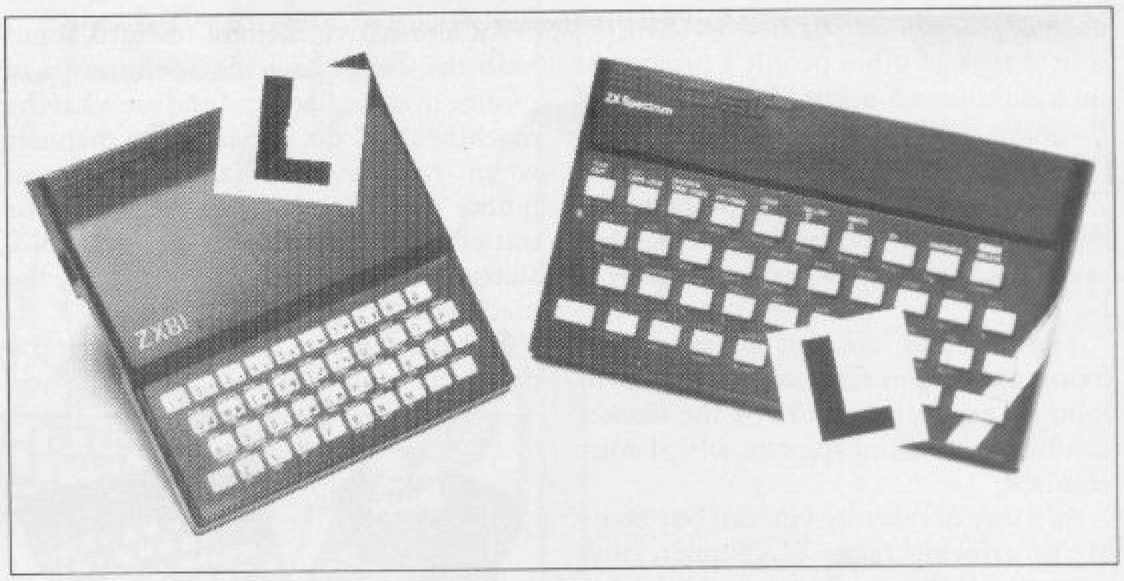
Address ________

SU10

FILESIXTY

GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.
Bug — an error in a program.
EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.
Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.
Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.
Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.
Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.
Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.
Port — a link to the outside world which can be used by programs and the computer.
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.
RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.
ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.
Software — programs which control the operation of the computer.
Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 112

continued from page 111

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

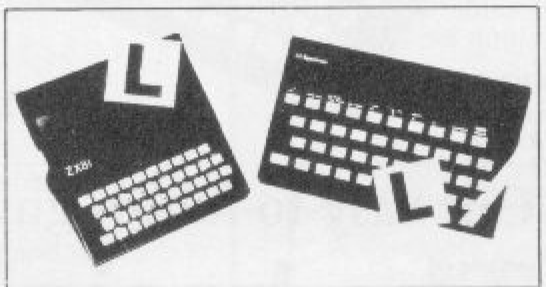
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD " " followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

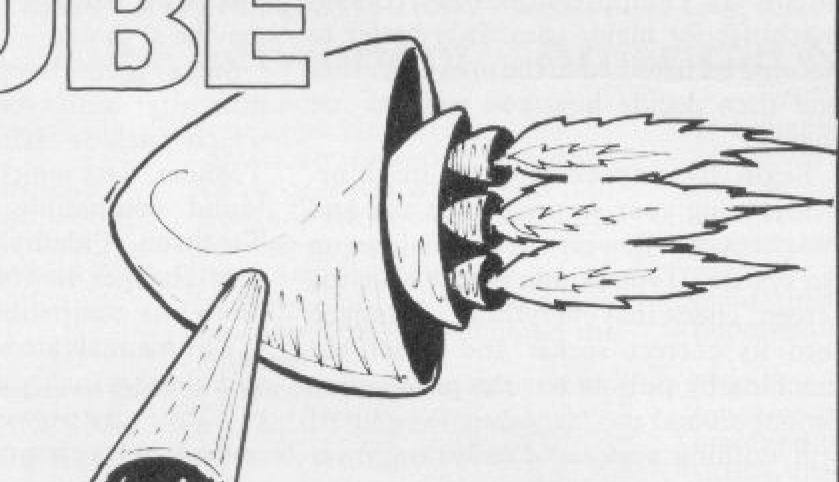
LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.

TUBE

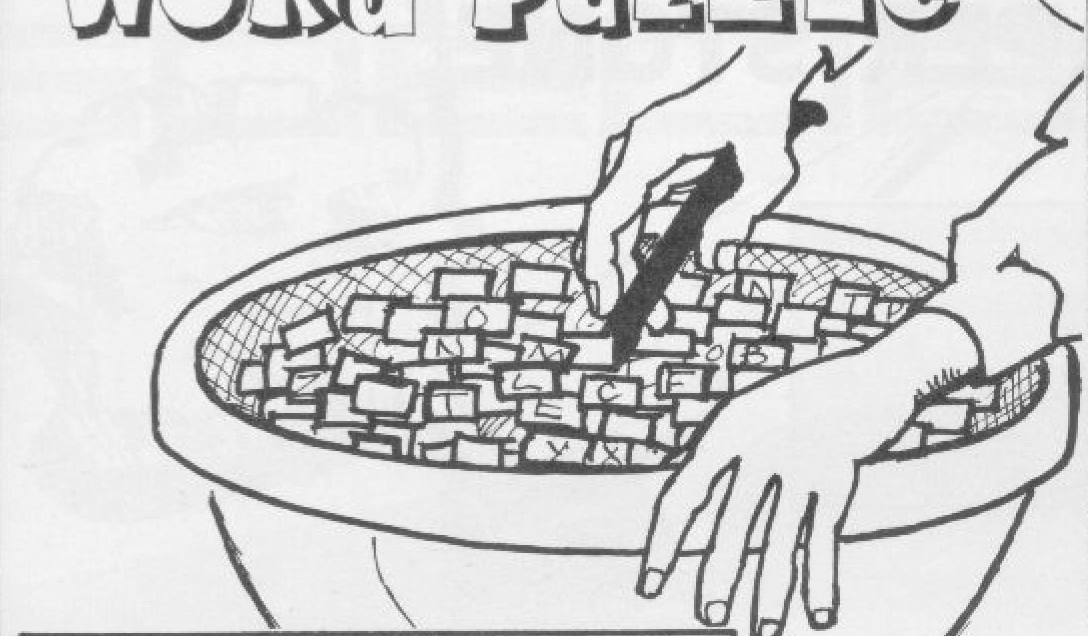


YOUR SUPPLY SHIP will appear, darting about, at the top of the screen. Pressing any key will stop it. A **Tube** will then start to descend from it. Your aim is to link the tube with the still-moving mothership, to transfer vital supplies. Slow the movement of the tube with 0 until you are ready to make the link.

Written for the 16K ZX-81 by Nicholas Watkins of Penn, Wolverhampton.

```
  10 FOR F=0 TO 20
  20 PRINT AT F,0;"(98)";AT F,31
;"(95)"
  30 NEXT F
  40 PRINT AT 0,1;"(30*99)";AT 2
0,1;"(30*9f)"
  50 FOR F=1 TO 19
  60 PRINT AT F,1;"(30*9h)"
  70 NEXT F
  75 SLOW
  80 LET X=4
  85 PRINT AT 21,0;"       PRESS A
NY KEY PLEASE"
  90 LET Y=INT (RND*22)+4
  92 PRINT AT 3,Y-1;"(1''1h'1')"
;AT 3,Y-1;"(3*9h)"
  95 IF INKEY$="" THEN GOTO 90
  96 PRINT AT 3,Y-1;"(1''1h'1')"
  97 PRINT AT 21,0;"
                    "
 105 PRINT AT 18,F;"(4*9h)"
 110 FOR F=2 TO 26
 115 PRINT AT 18,F;"(1h'1sP'1f'1
sP)"
 120 PRINT AT X,Y;"(1sP)";AT X,Y
;"(11)"
 130 LET X=X+.30
 135 IF INKEY$="0" THEN LET X=X-
.25
 140 IF X<18 THEN NEXT F
 150 IF X<18 THEN GOTO 96
 160 IF Y=F+2 THEN GOTO 200
 163 FAST
 164 SLOW
 165 FOR R=0 TO 3
 170 PRINT AT X-1,Y;"*";AT X,Y-1
;"*(1*)*";AT X+1,Y;"*";AT X-1,Y;
"(1*)";AT X,Y-1;"(1*)*(1*)";AT X
+1,Y;"(1*)"
 175 NEXT R
 180 PRINT AT 21,0;"           **
MISSED**       "
 190 IF INKEY$="" THEN GOTO 190
 195 GOTO 50
 200 PRINT AT 17,F;"(9h'9f'1sP'9
f)"
 210 PRINT AT 21,4;"     ***WELL
 DONE***    "
 220 GOTO 190
 500 SAVE "T.d"
 510 RUN
```

WORD PUZZLE



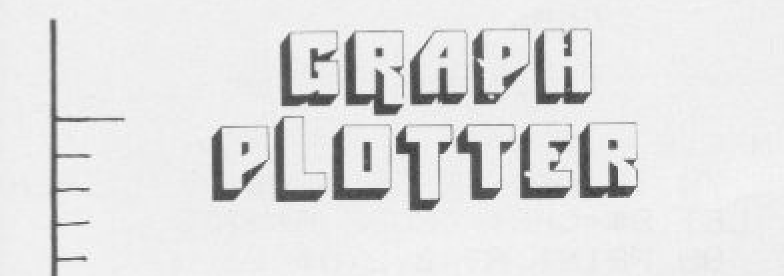
ENTER a seven-letter word. The computer will place it in the seven squares at the top of the screen. It will then mix it by sliding the middle letter down the vertical column, replacing it at the right or left end and then repeating the process several times.

Once the mixed word appears the aim is to restore it to the original word. Slide a letter down with 6, move it to the left end with 5, and to the right end with 8.

Word Puzzle was written by Denis McCarthy of Todmorden, Lancashire for the 16K Spectrum.

```
 10 BORDER 1: PAPER 6: INK 0
 20 CLS : PRINT AT 0,1;"Enter d
ifficulty level (1-5)? ";
 30 INPUT D: IF d<1 OR d>5 OR d
<>INT d THEN GO TO 30
 40 PRINT D;AT 12,5;"PRESS A KE
Y TO PLAY": PAUSE 4E4
 50 CLS : FOR f=1 TO 7
 60 PLOT 16+f*24,135
 70 DRAW 23,0: DRAW 0,-23: DRAW
 -23,0: DRAW 0,23: POKE 23658,8
 80 IF f=7 THEN FOR f=1 TO 4: P
LOT 112,f*24+15
 90 DRAW 23,0: DRAW 0,-23: DRAW
 -23,0: DRAW 0,23: NEXT F
 100 INPUT A$: LET C$=A$
 110 FOR k=1 TO 7
 120 IF CODE a$(k)<65 OR CODE a$
(k)>90 THEN GO TO 100
 130 NEXT K: GO SUB 270: LET M=0
 140 LET B$="": FOR C=1 TO D*5,
 150 LET B$=A$(1 TO 3)+A$(5 TO 7
): LET A$=A$(4)+B$
 160 IF INT (RND*2) THEN LET A$=
B$+A$(1)
 170 NEXT C: GO SUB 270
 180 IF INKEY$<>"6" THEN GO TO 1
80
 190 PRINT AT 6,15;" ";AT 18,15;
A$(4)
 200 LET L=(INKEY$="8")-(INKEY$=
"5"): IF L=0 THEN GO TO 200
 210 PRINT AT 6,18;A$(4)
 220 LET B$=A$(1 TO 3)+A$(5 TO 7
): LET A$=A$(4)+B$
 230 IF L=1 THEN LET A$=B$+A$(L)
 240 GO SUB 270: PRINT AT 18,15;
" ": LET M=M+1
 250 IF A$<>C$ THEN GO TO 180
 260 PRINT AT 2,3;"YOU SOLVED IT
 IN ";M;" MOVES";TAB 5;"ON DIFFI
CULTY LEVEL ";D: STOP
 270 FOR k=1 TO 7: PRINT AT 6,3+
K*3;A$(K): NEXT K: RETURN
```

GRAPH PLOTTER



NICHOLAS BRADLEY of Havant, Hampshire has written a simple **Graph Plotter** program for drawing block graphs on the 1K ZX-81. Numbers less than 43 will be plotted clearly and could then be copied by a printer.

```
   1 REM GRAPH DRAWER
   8 LET X=5
  10 PRINT "ENTER THE NUMBERS(UN
DER 43)";AT 21,0;"0";AT 16,0;"10
";AT 11,0;"20";AT 6,0;"30";AT 1,
0;"40"
  20 INPUT A
  25 IF A>43 THEN LET A=43
  30 FOR H=1 TO A
  40 PLOT X,H
  50 NEXT H
  60 LET X=X+1
  70 GOTO 20
```

KNIFE PAPER STONE



RUSSELL WOOBERRY of Farnham, Surrey has written a version of the traditional game of **Knife, Paper, Stone** for the 1K or 16K ZX-81. Choose one of the three by pressing K, P or S as appropriate. The computer will then make its choice at random and tell you whether you have lost or won. Knife cuts paper, paper wraps stone, and stone blunts knife. Press enter for another round.

```
   1 CLS
   2 RAND
   3 LET A$-""
   4 PRINT "CHOOSE?(PAPER,KNIFE
OR STONE)"
   5 IF INKEY$-"S" THEN LET A$="
STONE"
   6 IF INKEY$-"K" THEN LET A$="
KNIFE"
   7 IF INKEY$="P" THEN LET A$="
PAPER"
   8 IF A$="" THEN GOTO VAL "5"
   9 PRINT "YOUR CHOICE IS ";A$
  10 LET C-VAL "INT (RND*3+1)"
  11 IF C=VAL "1" THEN LET B$="S
TONE"
  12 IF C=VAL "2" THEN LET B$="K
NIFE"
  13 IF C=VAL "3" THEN LET B$="P
APER"
  14 PRINT "MY CHOICE IS ";B$
  15 IF A$=B$ THEN PRINT "DRAW"
  16 IF A$="STONE" AND B$="PAPER
" THEN PRINT "I WIN PAPER WRAPS
STONE"
  17 IF B$="STONE" AND A$="PAPER
" THEN PRINT "YOU WIN PAPER WRAP
S STONE"
  18 IF A$="KNIFE" AND B$="PAPER
" THEN PRINT "YOU WIN KNIFE CUTS
 PAPER"
  19 IF B$="KNIFE" AND A$="PAPER
" THEN PRINT "I WIN KNIFE CUTS P
APER"
  20 IF A$-"STONE" AND B$="KNIFE
" THEN PRINT "YOU WIN STONE BLUN
TS KNIFE"
  21 IF B$="STONE" AND A$="KNIFE
" THEN PRINT "I WIN STONE BLUNTS
 KNIFE"
  22 INPUT Z$
  23 RUN
```

SNOOKER



AT THE TOP of the screen appears an inverse 0 at the end of the cue. At the bottom of the screen appears the snooker table with a pocket in a random position. Choose a speed between 1 (slow) and 9 (fast). Then press 0 and the cue will send the ball towards or into the pocket. Press NEWLINE for another shot.

Snooker was written for the 1K or 16K ZX-81 by Peter Rawbone of West Norwood, London.

```
 10 LET B$="(i0)"
 20 CLS
 30 LET A$=""
 40 PRINT ,,"   (98)",,"   (98)
",,"   (98)",,"   O"
 50 GOSUB 210
 60 IF INKEY$<>"" THEN LET A$=I
NKEY$
 70 IF A$>="1" AND A$<="9" THEN
 LET B$=CHR$ (CODE A$+128)
 80 PRINT AT 0,2;B$
 90 IF A$<>"0" THEN GOTO 60
100 PRINT AT 0,2;" ";CHR$ 52
120 FOR B=0 TO 9
130 PRINT AT B,3;"(98)";AT B+1,
3;CHR$ 52
140 NEXT B
150 FOR B=6 TO INT (RND*2)+CODE
 B$-148
160 PRINT AT 11,B;" ";TAB (B+1)
;"O"
170 NEXT B
180 IF B=A THEN PRINT AT 11,A;"
";AT 12,A;"O"
190 INPUT A$
200 RUN
210 PRINT AT 10,3;"O";AT 11,4;"
OOOOO"
220 PRINT AT 12,7;"(15*9h)"
230 LET A=11+INT (9*RND)
240 PRINT AT 12,A;" "
250 RETURN
```

sinclair special

4





Inside...
Two special offers...
Six new software titles...
Microdrive!

Something for everyone, from Sinclair!

Welcome to another Sinclair Special. Even if you're not yet a Sinclair owner; I believe you'll find something of interest in this latest issue.

For instance, if you're looking for the best way to begin computing, turn to our back page. You'll see that leading Sinclair retailers are now offering the popular ZX81, complete with a 16K RAM Pack *and* a free software cassette, all for £45. That means savings of at least £29 on one of the world's all-time best-selling computers.

Those same retailers are also offering the ZX Printer at its regular price of £39.95, but accompanied by a *free* 5-roll Paper Pack, worth £11.95.

If you want to add even more speed and versatility to your ZX Spectrum system, you'll be pleased to hear that the new ZX Microdrive has now been officially announced.

Microdrives are being released on an order of priority basis. Spectrum owners who purchased direct from us will be sent order forms, in a series of mailings that begin with the earliest names on our list of Spectrum owners. If you didn't buy direct from us by mail order, send us your name and address (use the coupon in this Sinclair Special). We'll add your name to the list, and send you a colour brochure and details on how to order.

Finally, if you're looking for more ways to use your ZX system, take a look at the software opposite. There are programs for programmers, a space-chase and car race for arcade-game players, a brand new logic game for those who've exhausted 'the cube.'

The Cattell IQ Test is based on the definitive professional psychologists' test – and forms an accurate but easy way of measuring your own IQ. All the new programs are available direct from us, through the order form in this issue.

You'll see what I mean about Sinclair having something for everyone. And we'll have even more to show you at two forthcoming exhibitions: the PCW Show at the Barbican Centre, from September 28th to October 2nd, and the Great Home Entertainment Spectacular at Olympia, from September 17th to 25th.

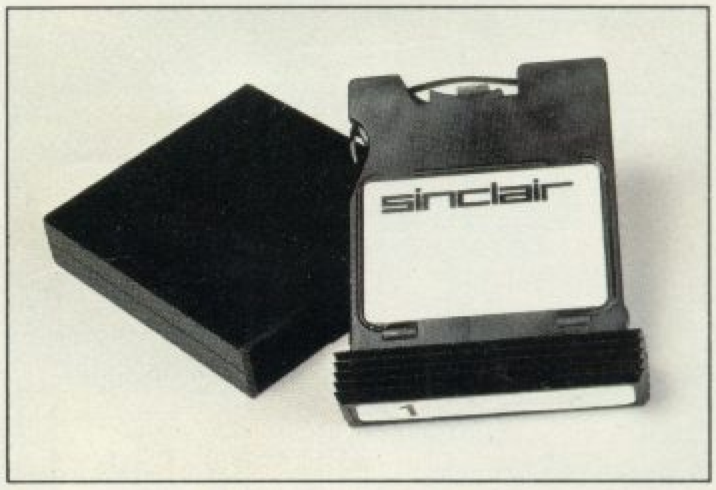
Nigel Searle, Managing Director
Sinclair Research Ltd.

ZX Microdrive System preview!



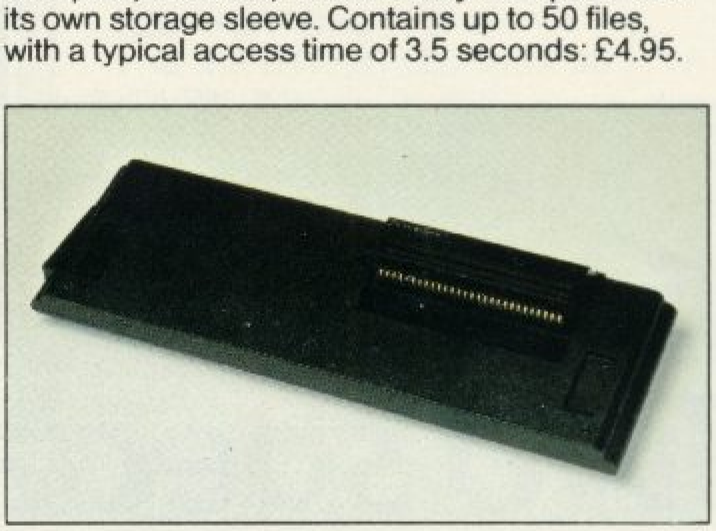
ZX MICRODRIVE

At least 85K bytes storage, loads a typical 48K program in as little as 9 seconds: £49.95.



ZX MICRODRIVE CARTRIDGE

Compact, erasable, revolutionary. Complete with its own storage sleeve. Contains up to 50 files, with a typical access time of 3.5 seconds: £4.95.

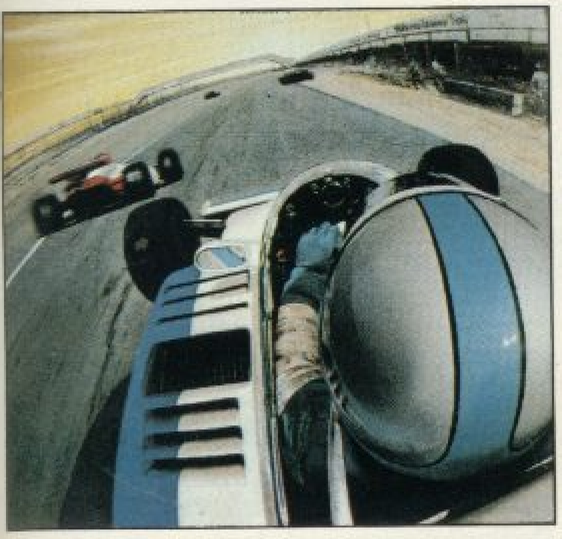


ZX INTERFACE 1

Necessary for sending and receiving information from ZX Microdrive. Includes RS232 interface and local area network facility for 2 to 64 Spectrums. Attaches to the underside of your Spectrum. Purchased with ZX Microdrive, just £29.95. As separate item, £49.95.

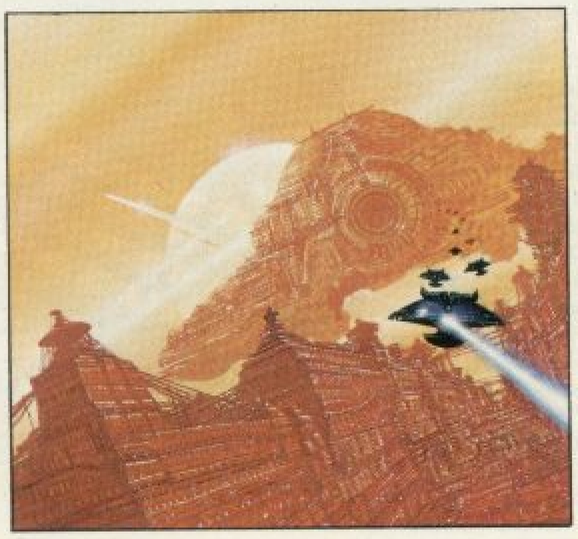
PSYCHOLOGY, GRAND PRIX RACING, BRAIN TEASING, PROGRAMMING, SPACE-BLASTING!

Sinclair have it all taped with six brand-new programs for ZX Computers!



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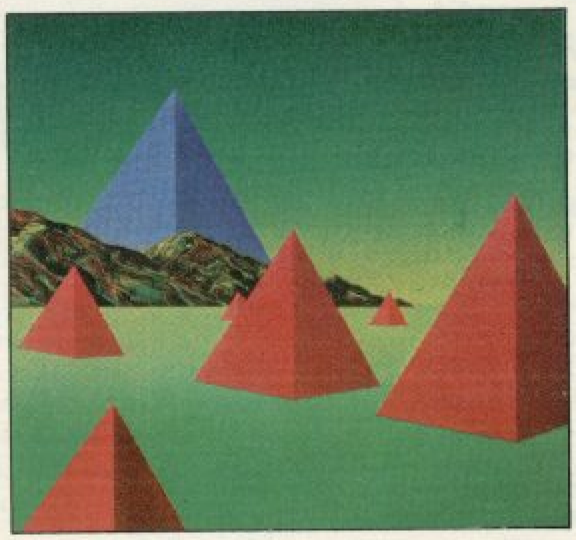
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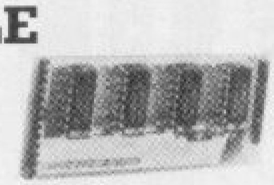
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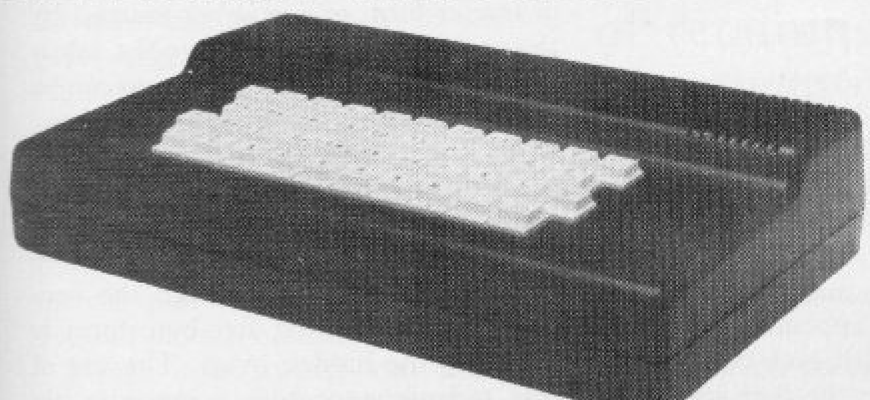


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Numbers are followed by information not in listings

Andrew Hewson returns to the program area of memory in RAM to find six bytes which are hidden in the program-following figures

LAST MONTH I explained how line numbers are held in both the ZX-81 and the Spectrum and showed how they could be studied using a short routine which investigated the program area in RAM. This month I shall study again the program area but for a different purpose.

I am doing so in response to the following question from Alan Sheldon of Aylesbury, He asks: **It would appear that numbers in the program area of memory are followed by additional information which does not appear in listings. Is that so and if so why?**

Sheldon is correct as can be seen by entering the Spectrum program listed in table one. The program will also work on the ZX-81 if line 15 is altered to read:

15 LET S=16509

Line 5 is a dummy line, the purpose of which is to allow the user to study the appearance of numbers in programs. When the program is RUN it looks at the contents of the first 21 bytes in the program area as I explained last month and displays them on the screen. The results for the Spectrum and the ZX-81 are shown in tables two and three respectively.

The first two bytes contain the line number (5) and the next two bytes specify the length of the remainder of the line (11 bytes). The next four bytes hold the character codes for the first line of the program:

```
5     LET A=1
10    PRINT "BYTE"; TAB 6;
      "CONTENTS"; TAB 16;
      "CHARACTER"
15    LET S=PEEK 23635+256*PEEK
      23636
20    FOR I=S TO S+20
25    PRINT I;TAB 8;PEEK I;TAB
      20;CHR$ PEEK I
30    NEXT I
```

Table 1. A Spectrum program which looks at the first 21 bytes of the program area.



• Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.

LET A=1

The character codes vary slightly between the two machines. For example, the code for the letter 'A' is 65 on the Spectrum and 38 on the ZX-81 although the code for the 'LET' is 241 on both machines. The full list of character codes is given in appendix A of the manual supplied with each computer.

On the Spectrum the next byte contains 14. That is not the code for the end of a line, as might be expected, but instead it is described in appendix A of the manual as "number". In fact, the byte acts as a signal to the LIST and other commands to ignore the byte and the contents of the five locations which follow it. Hence there is no indication in listings of the program that those additional locations are used. The line is terminated by the next byte which contains 13 — the ENTER character.

On the ZX-81 the character codes are different but the effect is the same. The location containing the code for '1' is followed by six "hidden" bytes, which do not appear in program listings.

Some clue as to the purpose of those hidden bytes can be gained by replacing line 5, the dummy line, by another line. Try, for example, RUNning the program with

5 LET A=2.7

as the dummy line. The characters for the number "2.7" occupy three bytes, not one as for the number "1", but again the number is followed by six hidden bytes. A few minutes' experimentation will show that whenever a number appears within a program six hidden bytes follow.

The reason for the use of the hidden bytes is that the ZX-81 and the Spectrum do not store and manipulate numbers in the character form in which they are displayed. They are converted into a "calculation" format and all additions, multiplications and so on are undertaken on the numbers in this format. When the result of a calculation is PRINTed it must be converted into characters for display on the screen. Similarly, the character form of a number entered by the user must be converted to the calculation format before a calculation can be executed.

All such conversions take time. To accelerate the execution of programs the conversion to calculation format is undertaken immediately a number in a program line is entered from the keyboard. The resulting five-byte form is stored in the hidden bytes. The use of this technique enables a considerable saving to be made in the time taken to execute a program, particularly if num-

Byte	Contents	Character
23755	0	?
23756	5	?
23757	11	?
23758	0	?
23759	241	LET
23760	65	A
23761	61	=
23762	49	1
23763	14	?
23764	0	?
23765	0	?
23766	1	?
23767	0	?
23768	0	?
23769	13	

Table 2. The first 15 lines of the screen display produced when the Spectrum program in table 1 is executed.

bers are included within FOR loops, in which case the same conversion would otherwise be undertaken many times. Of course, the time taken to deal with a program line entered from the keyboard is lengthened but not to an unacceptable extent.

The next question, from Hugo Cassidy of Dorchester, follows from the previous one. He asks: **Can you explain the method of encoding numbers on the Spectrum?**

Before explaining the form of encoding used it is useful to explain why it is necessary to encode numbers. The decimal system of counting has become universally-established for everyday purposes because people have 10 fingers and thumbs so we can conveniently count in tens, hundreds, thousands and higher powers of 10. Digital computers, however, count using bits which can be in one of only two states. It is as if they had many hands but each hand had only two fingers. Therefore they can count conveniently in twos, fours, eights, sixteens and higher powers of two. The primary reason for encoding is to convert decimal numbers to binary.

Unfortunately binary, written as a string of zeros and ones, is cumbersome for mere human beings to handle because large numbers of digits are often required. The number 1,000, for example, occupies nine digits when converted to binary. In the ZX-81 and the Spectrum the bits are grouped in bytes containing eight bits each so that the computers can hold a single positive integer number in the range 0 to 255 decimal in each memory location.

Hence it is usually convenient to consider bytes to be the fundamental unit of memory and ignore the constituent bits. Hexadecimal notation — numbers written in base sixteen — are used conveniently to represent bytes because two hexadecimal digits only are required. I think that most readers have enough trouble understanding decimal-to-binary conversions without introduc-



ing a further complication. I shall therefore continue to use the decimal version.

Given that it is necessary to convert numbers from decimal to binary, it is logical to use a binary format which is efficient and therefore fast for the computer to use. Two separate formats are used on the Spectrum, a special format for integers, or whole numbers, lying in the range -65535 to 65535 and a floating point format for all other numbers. The ZX-81 uses the floating point format only.

The integer format is the simplest to understand and so I shall explain it first. A suitable number, N, is converted to the five-byte form by setting the first and fifth bytes to zero and using the second byte to indicate the sign of the number, 0 for positive, 255 for negative. If the number is positive the value is stored in the third and fourth byte as:

Third byte=N—256 * INT (N/256)

Fourth byte=INT (N/256)

If N is negative the two bytes contain:

Third byte=65536—N—256 * INT ((65536—N)/256)

Fourth byte=INT ((65536—N)/256

The principal advantage of the use of integer format is that for positive integers the third and fourth bytes are in the form the Z-80A microprocessor uses when addressing locations in memory. Commands such as PEEK and POKE are executed much faster than they would otherwise be if the more complex floating point form were used to store the addresses to which they refer. The format also enables the calculator routines in the ROM to execute much more quickly when calculations involving integers only are performed.

The program in table one can be used to inspect the positive integer form by varying the first line. For example, entering:

```
5    LET A=47
```

will show that 47 is held as 0,0,47,0,0. The negative version cannot be inspected using this program because all numbers are stored in their positive form in the hidden bytes. If a number of preceded by a negative sign it is negated when the line is executed.

The program in table four gives the five-byte form of any number, positive or negative, entered from the keyboard. The program PRINTs the contents of the first item in the variables area, that is the number N entered by the user from the keyboard, because it is the first variable declared in the program. Note that the program should be initiated by entering RUN rather than GOTO 10 because doing so will cause the variables area to be CLEARed, thus ensuring that N is the first variable.

The floating point form is designed to provide the computer with a systematic method of retaining as much accu-

continued on page 122

'The floating point form is designed to provide the computer with a systematic method of retaining as much accuracy as possible in any given calculation'

```
10    INPUT N
20    PRINT N;"  ";
30    LET A=PEEK 23627+256*PEEK
      23628
40    FOR I=A+1 TO A+5
50    PRINT PEEK I;"  ";
60    NEXT I
70    GOTO 10
```

Table 4: A Spectrum program to inspect the five-byte form of a number entered by the users.

To run the program on the ZX-81 change line 30 to read:

```
30    LET A=PEEK 16400+256*PEEK
      16401
```

```
210   LET N=O
220   INPUT X
230   LET S=SGN X
240   LET X=ABS X
250   LET X=2*X
260   LET N=N+1
270   IF X<2147483648 THEN GOTO
      30
280   LET A=INT (X/16777216)
290   LET X=X—16777216*A
300   LET B=INT (X/65536)
310   LET X=X—65536*B
320   LET C=INT (X/256)
330   LET D=X—256*C
340   PRINT "EXPONENT="; 160—N
350   PRINT "MANTISSA=";A-
      128*(S=1);" ";B;" ";C;" ";D
```

Table 5. A Spectrum program to calculate and PRINT the floating point form of a number entered from the keyboard.

continued from page 121

racy as possible in any given calculation. Some numbers cannot be completely specified in decimal form. The fraction one-third in decimal form consists of 1.3 followed by an infinite number of threes so that expressing it as 1.3333, for example, is almost, but not exactly, correct. The same problem occurs when binary arithmetic is used.

The solution is to retain only the most significant digits at each stage in a calculation. Provided more significant digits are retained than are required in the answer then in all but the most exceptional circumstances the calculated result will be accurate enough for practical purposes.

The program listed in table five calculates and PRINTs the floating point form of a number entered by the user. The line numbers have been set so that it can be placed in memory at the same time as the inspection program in table four. By entering the same number into both programs the user will see that the calculation is correct.

The program has two parts. The first stores the sign, S, of the number, X, entered by the user. It then multiplies the absolute value of X successively by



2 until the result exceeds 2 raised to the power 31 or 21474383648. The number of multiplications executed is stored in N. The new value of X then lies necessarily between 2 to the power 31 and 2 to the power 32 and so the integer part of the number can be stored exactly in 31 bits. Thus by discarding the fractional residue the number can be stored in four bytes, each containing eight bits with one bit left over to hold the sign of the number. The four bytes together are called the mantissa.

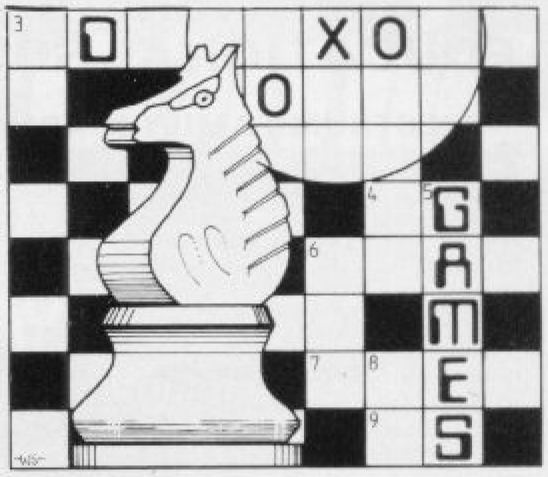
The second part of the program calculates the values held in each of the four bytes and stores them in the variables A, B, C and D and then PRINTs the variables. An adjustment is made to the value of A depending on the sign of the original number. In effect A is less than 128 for positive numbers and greater than or equal to 128 for negative numbers.

The fifth byte of the floating point form is used to store the exponent, that is the number of times that the mantissa must be divided or multiplied by 2 to place the decimal point in the correct position in the number. The program calculates that number using N, the number of multiplications made originally. The result is adjusted by adding 160 so that numbers greater than one have exponents greater than or equal to 128 and numbers less than one have exponents less than 128.

If a number with an absolute value greater than 4294967296, or 2 raised to the power 32, is entered into the program in table five the result will be incorrect because there is no provision for successive division by 2 to yield a number in the required range. It is easy to adjust the program to perform such successive divisions but that is left as an exercise for the reader.


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Quentin Heath discovers that the Artic series of adventures have been causing concern.



Castaways lost on island of Espionage

THE ARTIC adventures, A, B and C have been causing a great deal of concern among readers of this column. Many people think that the games are unsolvable but Artic says that there is an answer to all the problems which are encountered when the programs are run.

The program which is causing the most difficulty is **Espionage Island.** At the beginning you are in an aircraft which is hurtling out of control towards earth and a spectacular crash. Once you have landed it is necessary to defeat the enemy on the island and to discover its mysterious secret.

Unfortunately some hapless adventurers have not been able to get out of the aircraft before it crashes. That seems to be a common problem. It seems logical that there would be a parachute available in an aircraft but the first problem is finding it. You may have tried everything. One reader tried to get into the captain's empty cabin but to no avail.

Getting the parachute is quite simple. The commands are 'Take parachute' followed by 'Wear parachute'. If you are not careful at that point you could finish in mid-air with no visible means of support.

The correct way to make your exit is to 'Open door' and not 'Pull the handle'. If you take the latter course you will be flung into open space and have to make a landing without a parachute.

You can jump out of the aircraft without further problems but remember that you should 'pull cord' to allow your parachute to open, as soon as you are out of the aircraft.

When you land on the island tell the computer to 'drop chute' to hide all evidence of it from the enemy. Strangely, that is the most difficult part of the adventure for many players. Once past that point you can progress fairly rapidly.

One area of the adventure which is rarely discovered is a special object hidden in the wreckage of the aircraft. Tell the computer to 'Touch dark corner' and you will discover a string of lucky beads. You may be inclined to leave them at the site but you should not, as you will need them later.

From the aircraft wreckage you can go south or east. If you go east for two moves you will find burnt bushes and arrive in a jungle clearing. It is then a short hop south and then east before you encounter a native girl who will prove useful.

Some readers have tried to interrogate the girl but that will prove useless. All she will understand is a little bribery and corruption. She will barter with you and the only thing which you have is the string of beads. Offer those to her and she will give you a weapon.

The native's weapon seems just as useless as the string of beads. You will find that you can do little with it in the present situation. That is because it was given to you for another purpose, which is much removed from the native girl and the plain.

To learn the purpose you should make three moves west, one move north-west and past the aircraft wreckage again you will find yourself in the guard's clearing. You should be careful there as there are enemy guards patrolling the area and you would not want to be locked up.

If you go south again you will find the guard's hut and it is at that point that you must use the weapon. Killing the guard is not a vicious random act. Despite your doubts everything has a logical flow in this adventure. If you do not kill him you could be locked up and encounter further difficulties, like trying to escape from an enclosure.

From the guard's hut you can travel south to the river cove. The name of the location should suggest to you that there is a boat somewhere near. If it does not you should try to start thinking in those terms if you want to complete the adventure. There is a reason for every event and location, no matter how unlikely it may seem at the time.

From the river cove you will discover a boat and can start your way down the river to the rest of the island.

There is another way around the island if you go back to the grass plain and the native girl. If you go south from there you will find yourself on an eroded bank. A crevasse lies in front and a stick lies on the grass verge.

You have to do something very illogical with the piece of wood. It should be dropped into the crevasse. If you move forward after dropping the stick you will not fall into the crevasse. The stick has turned into a bridge which you can cross.

The location following the bridge is a rocky slope and you are given two directional options. What you should not do, if you are a newcomer to the game, is to go east.

That direction will take you to the swamp. If you go into the swamp keep a map record of which directions you take or you will finish in the quicksand.

There are several objects which can be collected in the quest for the secret of the island. The string of beads and the weapon are just two of them. The list of all possible finds is lengthy but it includes a penlight, a torch, a branch, a gun, a match and a rope.

Some of those items will be found in the vicinity of the aircraft wreckage. Usually the objects have a link with their surroundings. For instance, you would expect to find a boat near a river.

Espionage Island requires a great deal of thought to solve and is particularly suited for expert adventure gamers. All that is needed to crack the secret of the game is an understanding of the situations as related to the objects. When you can get that the rest should be relatively easy.

SPECTRUM & ZX81 EDUCATIONAL SOFTWARE

SPECTRUM FAMILY LEARNING SERIES

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1-21 **Football Manager**
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2-12 **Avenger**
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2-13 **Sentinel**
Guard your mother ship against alien attacks. 48K RAM **£4.95**

2-14 **Meteor Storm**
Spectrum version of the ever-popular arcade game. 16K or 48K RAM **£4.95**

2-15 **Star Trek**
Popular space program brought to life by excellent graphics. 48K RAM **£4.95**

2-21 **Frogger**
Manoeuvre the frog across the road avoiding heavy traffic. 48K RAM **£5.95**

2-22 **Crazy Balloons**
Guide the balloons round the maze without bursting. 48K RAM **£5.95**

2-23 **Arcadia**
The expert's version of the popular 'Invaders' game. 16K or 48K RAM **£5.95**

2-24 **Golf**
The finest of golf handicap games. 48K RAM **£5.95**

2-25 **Test Match**
More exciting than the real thing! 48K RAM **£5.95**

2-26 **Derby Day**
This favourite has to be a winner. 48K RAM **£5.95**

2-27 **Rescue**
Rescue the Princess from marauding patrols. 48K RAM **£5.95**

2-28 **The Orb**
Discover the Orb in the depths of the temple but watch the monsters. 48K RAM **£5.95**

2-29 **Jackpot**
The harmless way to take on the one-armed bandit. 48K RAM **£5.95**

2-31 **Football Manager**
See 1-21 under ZX81. 48K RAM **£6.95**

2-41 **Comp-U-Share**
See 1-31 under ZX81. 48K RAM **£9.95**

2-42 **Comp-U-Tax**
See 1-32 under ZX81. 48K RAM **£9.95**

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Sinclair User, October '82

"If each game was on a separate tape and selling for £5 each I would still recommend them. But all on one for £5 . . . ! This sort of value for money just has not been seen before on any personal computer."

"Without sounding pushy I would like to conclude this review by saying — if you have a ZX-81 and like games, then you should buy Michael Orwin's cassette 4."

2 extracts from *ZX Computing*, Oct/Nov '82

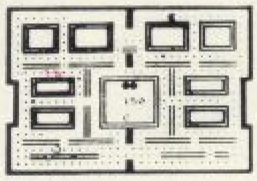
"Eight games, including an excellent version of the Scramble arcade game . . . Easy to operate, graphically impressive and good value for money."

The Times, Saturday 11th December 1982 (about Cassette 4)

NEW! FOR 16K SPECTRUM

(will also run on 48K Spectrum)

CASSETTE A Ten programs for £6



GHOST GOBBLER Eat the ghosts before the ghosts eat you. Eat a star and you can chase the ghosts for a while.

ALIENKILL Control lasers, rockets and a force-field to stop the aliens from landing.
MOUSETRAP Trap the mouse in the corner but not anywhere else.
REVERSI A game of skill with simple rules but sophisticated tactics. Play against the computer.
LASER DEFENCE Control the laser sight to shoot down the alien ships. Machine code sound routines.

TANK BATTLE For 2 players simultaneously or play against the computer. Each player has 2 rotate controls and move and fire controls. The tanks fire steerable missiles.
PHOEBUS A puzzle.
BLACKSPOT Gobble the stars and avoid running into black spots created by crossing your own path.
CUBE Manipulate a cube any size from 2×2×2 to 7×7×7.
MINEFIELD Collect the crowns while avoiding the mines and the electrified fence.

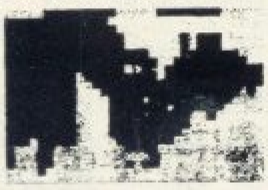
plus an extra . . .

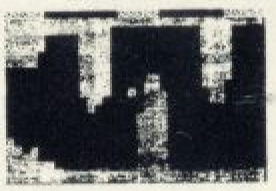
GRAPHIC DEMO Did you know your Spectrum could do all this!?

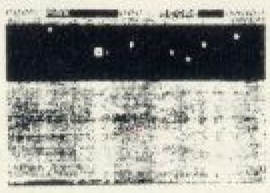
CASSETTE 1, eleven programs (including 7 in machine code) for 1K ZX81 **£3.80**	**CASSETTE 2**, ten games in Basic for 16K ZX81 **£5**	**CASSETTE 3**, eight programs (including 1 in machine code) for 16K ZX81 **£5**

CASSETTE 4 8 games for 16k ZX81 £6

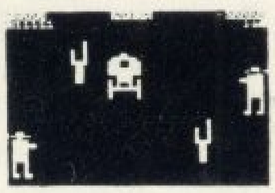
ZX-SCRAMBLE (machine code) with 3 stages.
Bomb and shoot your way through the fortified caves.



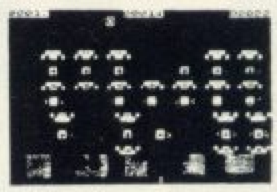


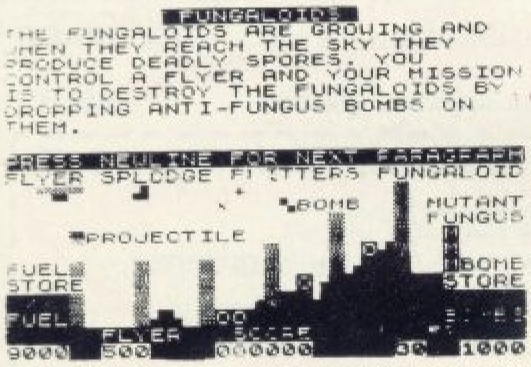


GUNFIGHT (machine code)



INVADERS (machine code)





GALAXY INVADERS (machine code)
Fleets of swooping and diving alien craft to fight off.

SNAKEBITE (machine code)
Eat the snake before it eats you. Variable speed. (very fast at top speed).

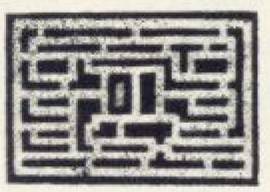
LIFE (machine code)
A ZX81 version of the well known game.

3D TIC-TAC-TOE (Basic)
Played on a 4×4×4 board, this is a game for the brain. It is very hard to beat the computer at it.

7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available form J. Steadman).

CASSETTE 5 8 games for 16k ZX81 £6

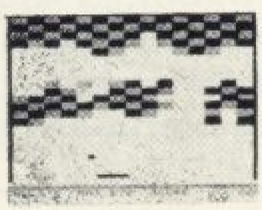
BYTE-MAN (machine code)
(previously available from Mindseye)



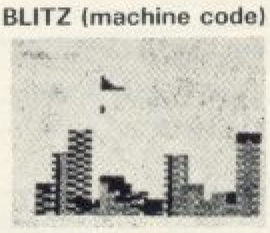
SPACE RESCUE (machine code)
(previously available from Mindseye)



BREAKOUT (machine code)



BLITZ (machine code)



PLANETOIDS (machine code)
Rotate, move, fire and hyperspace controls. Wide range of choice of speed and difficulty.

DODGEMS (machine code)
Dodge the computer's car while eating the dots.

DRAUGHTS (machine code)
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MERCHANT (Basic)
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7 of the 8 games are in machine code because it is much faster than Basic.

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ZX81 & SPECTRUM SOFTWARE WANTED

SOFTWARE DIRECTORY

LAST MONTH *Sinclair User* began a new service to readers – a software directory. Last issue we published the first part of a list of all the software of which we know on the Sinclair market, with the machine on which it should be played, the publisher and the type of program. It is completed here.

If we have reviewed a cassette we shall give it a rating known as the Gilbert Factor, named after our software editor John Gilbert. Although the final figure is out of 10 it is the result of complicated calculation involving a number of factors which are taken into account when assessing how good a cassette is.

The factors include value for money, the layout of the screen instructions, conciseness of the program and its speed of operation, the accomplishment of the task it aims to achieve, the innovation of concept, and the use it makes of the machine.

While trying to ensure that all software is dealt with it is inevitable that some will be omitted. We will remedy any omissions later.

Lack of space means that we cannot publish the complete list in one issue. The remainder of the list will be published next month and we will repeat this month's one month later.

Any suggestions for its improvement will be welcomed.

Name	Machine	Company	Type	Gilbert factor
NightFlite	16K Spec.	Hewson	Sim.	5
Nowotnik Puzzle	16K Spec.	Phipps	Game	7
Nowotnik Puzzle	16K ZX-81	Phipps	Game	*
Odds-on	16K Spec.	RSD	Game	*
O Level Chemistry	48K Spec.	Calpac	Educ.	*
O Level Chemistry	16K ZX-81	Calpac	Educ.	*
O Level Fench Revision	16K ZX-81	Rose	Educ.	*
O Level Maths Revision	16K ZX-81	Rose	Educ.	*
O Level Physics	16K Spec.	Homestudy	Educ.	*
O Level Physics	48K Spec.	Think Tank	Educ.	*
Omnicalc	48K Spec.	Microsphpere	Bus.	9
Orbiter	16K Spec.	Silversoft	Arcade	7
Original Superchess	48K Spec.	CP Software	Tradtitional	*
Original Superchess	16K ZX-81	CP Software	Traditional	*
Othello	16K Spec.	CP Software	Traditional	*
Othello	16K Spec.	M.O.I.	Traditional	*
Othello	16K ZX-81	M.O.I.	Traditional	*
Payroll	48K Spec.	Hilderbay	Bus.	9
Payroll	16K ZX-81	Hilderbay	Bus.	*
Payroll	32K ZX-81	Soft Tech	Bus.	*
Payroll	48K ZX-81	Soft Tech	Bus.	*
Peek	16K Spec.	Zen	Utility	*
Penetrator	48K Spec.	Mel. Hse.	Arcade	7
Personal Banking System	48K Spec.	Hilton	Bus.	*
Personal Banking System	16K ZX-81	Hilton	Bus.	*
Pharoah's Tomb	16K ZX-81	Phipps	Adven.	*
Pilot	16K ZX-81	Hewson	Simulation	7
Pimania	16K ZX-81	Automata	Simulation	*
Pimania	48K Spec.	Automata	Simulation	7
Pinball	16K Spec.	Winters	Game	*
Planet of Death	16K Spec.	Artic	Adven.	6
Planetoids	16K Spec.	Sinclair	Arcade	8
Polynomials	16K Spec.	University	Utility	8
Polynomials	16K ZX-81	University	Utility	
Pool	16K Spec.	Bug Byte	Game	7
Pre/early school cassettes	16K Spec.	Essex	Educ.	*
Primary Arithmetic	16K Spec.	Rose	Educ.	*
Primary Arithmetic	16K ZX-81	Rose	Educ.	*
Print Shop	16K Spec.	CCS	Simulation	8
Print Shop	16K ZX-81	CCS	Simulation	*
Pro-Golf	16K Spec.	Hornby	Game	7
Programmer's Dream	16K Spec.	Work Force	Utility	8
Programme Enhancement Package	16K ZX-81	R and R	Utility	*
Puckman	16K ZX-81	Hewson	Arcade	*
Purchase Ledger	16K ZX-81	Hestacrest	Bus.	*
Ramopoly	48K Spec.	J Fletcher	Game	*
Red Weed	48K Spec.	Lothlorian	Simulation	*
Regression	16K Spec.	University	Utility	8
Regression	16K ZX-81	University	Utility	*
Renumber Delete	16K Spec.	Work Force	Utility	*
Renumber Delete	16K ZX-81	Work Force	Utility	*
Rescue	48K Spec.	Computer Rent	Arcade	*
Reversi	16K Spec.	Sinclair	Traditional	8
Roulette	16K Spec.	Newsoft	Traditional	*
Roulette	48K Spec.	Dymond	Traditional	*
Sales Day Book	48K Spec.	Transform	Bus.	*
Sales Day Book	16K ZX-81	Transform	Bus.	*
Sales Ledger	16K ZX-81	Hestacrest	Bus.	*
Secret Valley	16K Spec.	Newsoft	Adven.	*
Secret Valley	16K ZX-81	Newsoft	Adven.	*
Self-teach Program	16K Spec.	Anvil	Educ.	*
Self-teach Program	16K ZX-81	Anvil	Educ.	*
Sentinel	16K Spec.	Abacus	Arcade	*
The Settler	16K Spec.	BSS	Utility	*
The Settler	16K ZX-81	BSS	Utility	*
Sideways Copy	16K ZX-81	D King	Utility	*
Sheepwalk	48K Spec.	Virgin	Game	7
Ship of Doom	48K Spec.	Artic	Adven.	7
Shiva Special 1	16K Spec.	Shiva	Games	*
Shopping List	16K Spec.	SD	Utility	*
Sky Raider	16K Spec.	C M Smith	Arcade	*
Slippery Sid	16K Spec.	Silversoft	Arcade	8
Slow Loader	16K Spec.	ELR	Utility	9
Snail Logo	48K Spec.	CP	Language	*
Softalk 1	48K Spec.	CP	Utility	*
Softalk 2	48K Spec.	CP	Utility	*
Solo Whist	16K Spec.	Video Soft.	Traditional	*
Sound FX	16K Spec.	D K Tronics	Utility	6
Space Fighter	16K Spec.	Winters	Arcade	*
Space Intruders	16K Spec.	QS	Arcade	7
Space Raiders	16K Spec.	Sinclair	Arcade	6
Space Raiders	16K ZX-81	Sinclair	Arcade	*
Space Trek	16K ZX-81	JRS	Arcade	*
Space Zombies	16K Spec.	Mikro-Gen	Arcade	*
Speak and Spell	48K Spec.	S and G	Educ.	*
Spec. Assembler	48K Spec.	Artic	Utility	*
Spec. Bug	16K Spec.	Artic	Utility	*
Spec. Tape Copier	16K Spec.	S Giza	Utility	*
Spec. Compiler	48k Spec.	Softek	Utility	7
Spec.Editor/ Assembler	16K Spec.	Picturesque	Utility	8
Spec. Forth	48K Spec.	Abersoft	Language	9
Spec. Forth	48K Spec.	CP	Utililty	*
Spec. Frogs/ Showdown	16K Spec.	Artic	Arcade	*
Spec. Gobbleman	16K Spec.		Arcade	*
Spec. Invaders	16K Spec.	Artic	Arcade	*
Spec. Invasion Force	16K Spec.	Artic	Arcade	*
Spec. Microchess	16K Spec.	Artic	Traditional	*

Cassette Round-up

Name	Machine	Company	Type	Gilbert factor
Spec. Monitor	16K Spec.	Picturesque	Utility	8
Spec. Scramble	16K Spec.	Work Force	Arcade	7
Spec. Sound	16K Spec.	M Afzal	Utility	*
Spellbin	16K Spec.	Startersoft	Educ.	*
Spookyman	16K Spec.	Abbex	Arcade	7
Spreadsheet	48K Spec.	MICROL	Bus.	7
Superchess II	48K Spec.	CP	Traditional	8
Super Play I	16K Spec.	Video	Games	*
Tai	16K ZX-81	PSS	Game	*
Tank Battle	16K Spec.	D K Tronics	Game	8
Tape Breaker	16K Spec.	Spectrasoft	Utility	*
Tasword	48K Spec.	Tasman	Bus.	8
Tasworld II	48K Spec.	Tasman	Bus.	9
Teacheraid	16K Spec.	B Farris	Educ.	*
Teach Data	48K Spec.	B Farris	Educ.	*
Tennis	16K Spec.	Winters	Game	*
Tenpin	16K ZX-81	Phipps	Game	*
Test Match	48K Spec.	Computer Ren.	Game	*
The Orb	48K Spec.	Adven.	Com. Ren.	*
The Great Western	16K Spec.	Game	New Soft	*
The Great Western	16K ZX-81	Game	New Soft	*
Time Bandits	16K Spec.	Adven.	New Soft	*
Time Bandits	16K ZX-81	Adven.	New Soft	*
Time Gate	48K Spec.	Arcade	QS	8
Tomb of Dracula	48K Spec.	Adven.	Felix	*
Tomb of Dracula	16K ZX-81	Adven.	Felix	*
Trace	16K Spec.	Utility	Zen	*
Transylvanian Tower	48K Spec.	Adven.	Shepherd	*
Troon	48K Spec.	Game	Hornby	8
Tube Train Terror	48K Spec.	Game	JRS	*
3D Tunnel	48K Spec.	Arcade	New Gen.	9
The Turk	48K Spec.	Traditional	OCP	8
Use and Learn	16K Spec.	Utility	MiCROL	8
Velnor's Lair	48K Spec.	Adven.	QS	8
Voice Chess	48K Spec.	Traditional	Artic	9
Volcanic Dungeon	16K ZX-81	Adven.	Carnell	*

Name	Machine	Company	Type	Gilbert factor
Volcanic Dungeon	48K Spec.	Adven.	Carnell	6
Vu-Calc	16K Spec.	Bus.	Sinclair	7
Vu-File	16K Spec.	Bus.	Sinclair	8
Vu3D	48K Spec.	Utility	Sinclair	8
Warlord	48K Spec.	Simulation	Lothlorian	*
Wizard's Warriors	16K Spec.	Arcade	Abersoft	*
Word Fit	16K ZX-81	Game	Ram Writer	6
Word Processor	48K Spec.	Bus.	MiCROL	*
World Info	48K Spec.	Utility	Wimsoft	*
X Ray	16K Spec.	Utility	Zen	*
Yahtzi	48K Spec.	Traditional	Work Force	*
Yomp	16K Spec.	Arcade	Virgin	7
Zodiac I	16K ZX-81	Utility	Stellar	*
Zodiac II	16K ZX-81	Utility	Stellar	*
Zodiac F	48K Spec.	Utility	Stellar	7
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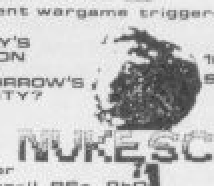
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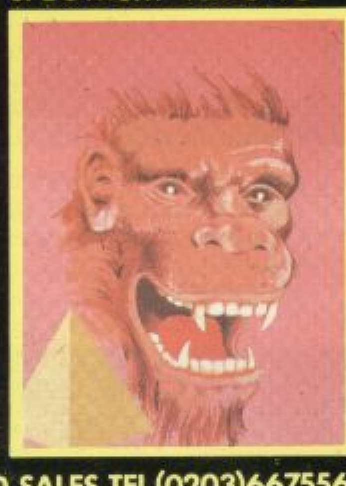
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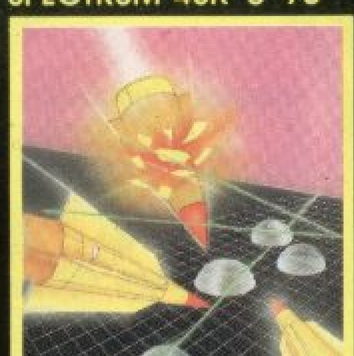
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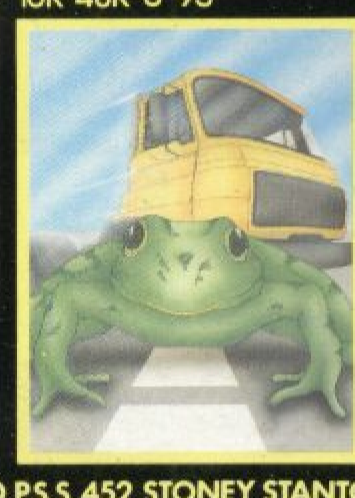
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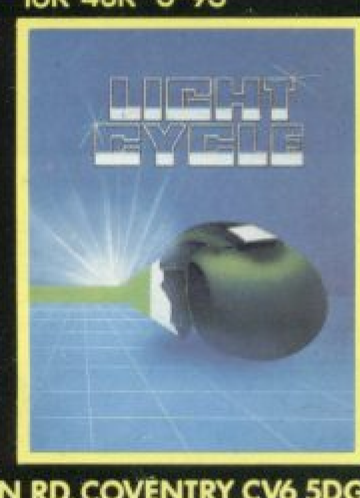
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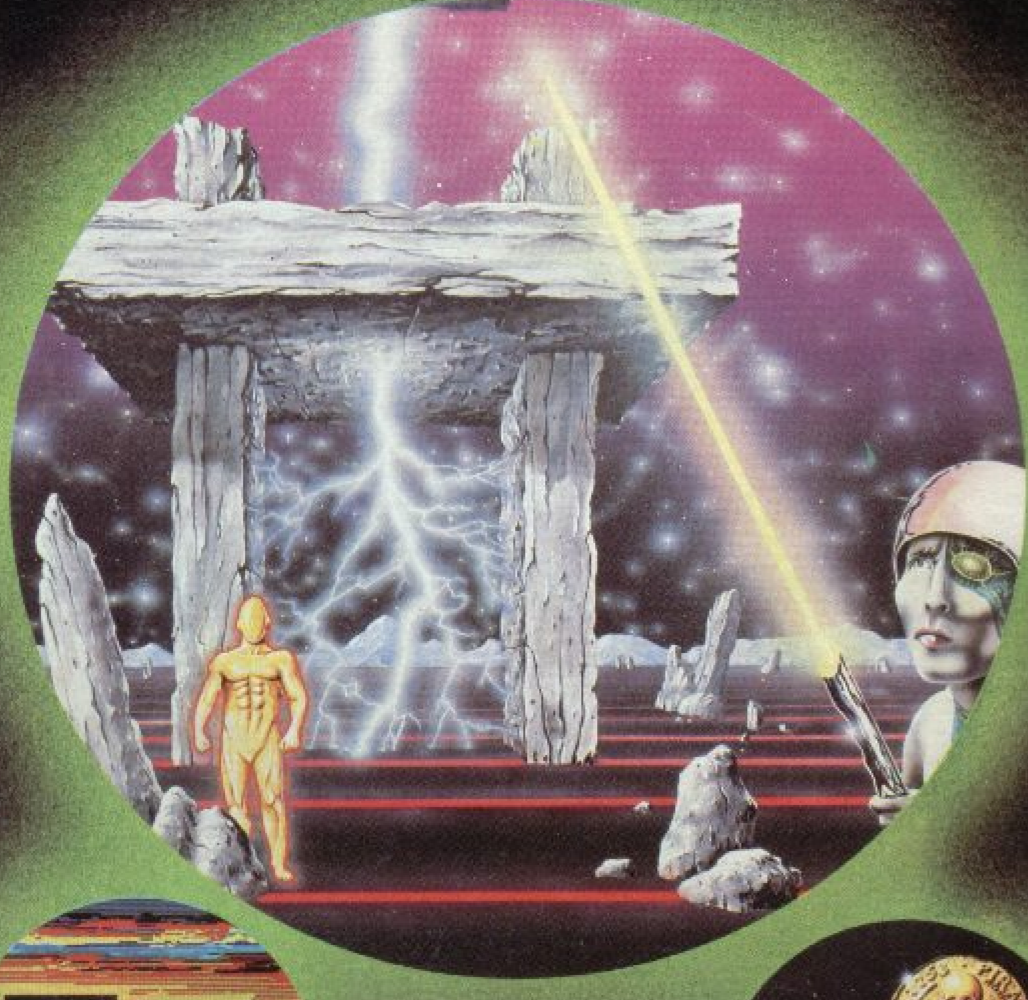
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